FINAL WETLAND AND STREAM MITIGATION REPORT

SR 900: 78th Vicinity to Newport Way Widening (MP 20.09 to MP 21.08)

Issaquah, WA
WIN #A90098V

Prepared by
Northwest Region
Environmental Services

February 2008

Washington State
Department of Transportation

List of Contributors

WSDOT Biology

Trina Miller, Wetland Biologist
Cory Peterson, Wetland Biologist
Terry Sullivan, Sr. Wetland Mitigation Biologist
Colleen Cleveland, Wetland Biologist

WSDOT Permits

Liz Kriewald, WSDOT Environmental Coordinator

WSDOT Landscape Architecture

Alisa Sawich, Landscape Designer, Mitigation Site Design
Lindsey Horton, Landscape Designer, Mitigation Site Design
Andrea Hassler, Landscape Designer, Mitigation Site Design
Beth MacLaren, Landscape Design Team Leader

Project Design Team

John Johnson, Project Engineer
Laura Claywell, Project Design Lead
Susan Johnson, Project Designer

EXECUTIVE SUMMARY

The Washington State Department of Transportation (WSDOT) proposes to widen State Route (SR) 900 from two to five lanes between Newport Way and SE 83rd Place in Issaquah, Washington, between milepost (MP) 20.09 and MP 21.08. The project will also provide standard shoulders on the westbound off-ramp from Interstate 90 to SR 900. The project will construct two new general-purpose lanes with shoulders, a two-way left turn lane, a bike lane, a multi-use sidewalk, a bridge, retaining walls, and stormwater facilities. It will also repair two fish passage barriers identified in the corridor. A total of 2.80 acres of new impervious surface will be created. This project is the second phase of a two-part project to improve safety and relieve congestion on SR 900; WSDOT completed the first phase in 2004.

Biologists delineated nine wetlands along the proposed widening area and in the ramp interchange area. Eight of the nine wetlands are within the widening corridor between Newport Way and SE 83rd Place; the remaining one is located in the SR 900/I-90 interchange, adjacent to the westbound I-90 off-ramp. They range from small, low-functioning, palustrine emergent wetlands to larger, multi-vegetation class systems with moderate to high water quality and habitat functions.

The streams identified within the project limits all drain to the Tibbetts Creek subbasin of the Cedar-Sammamish watershed. Within the study area, SR 900 crosses or parallels Tibbetts Creek and nine if its tributaries. Of these streams, only five have documented fish use.

Roadway construction will permanently impact 0.75 acre (32,534 ft^2) of palustrine scrub-shrub and palustrine emergent wetland habitat. Approximately 0.70 acre (30,571 ft^2) of wetland buffer and 1.01 acre (43,994 ft^2) of stream buffer will be permanently lost. Primary wetland functions to be impacted include *flood flow alteration, sediment removal, nutrient and toxicant removal, erosion control and shoreline stabilization, production of organic matter and its export, general habitat suitability,* and *general fish habitat*.

The proposed widening project will extend culvert lengths for several of the smaller streams; approximately 139 linear feet of stream will be placed into culverts. The existing Tibbetts Creek Bridge will be widened on both sides of the existing structure. The project will also include rectifying fish passage barriers at West Fork Tibbetts Creek and Clay Pit Creek, opening a combined 2,789 linear feet of potential habitat available to salmonids.

The project will mitigate for impacts to wetlands, streams, and buffers by:

- Creating 1.74 acres and enhancing 0.11 acre of primarily shrub-scrub wetland at the Lake Sammamish State Park (LSSP) site to mitigate for the 0.75 acre of impacts to primarily palustrine emergent wetlands.
- Enhancing 233 linear feet of Tributary B and 516 linear feet of Tributary 0178a at the LSSP site to mitigate for the 139 linear feet of perennial stream and 125 linear feet of ephemeral stream that will be culverted or enclosed in the new stormwater conveyance system as a result of the widening project.
- Enhancing 2.23 acres of buffer around the LSSP site and 0.58 acre at the Tributary B site to mitigate for project impacts to 1.71 acres of wetland and stream buffers.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Purpose and Goals

This wetland and stream mitigation report has been prepared to meet local, state, and federal requirements for mitigation for proposed wetland and stream impacts due to the SR 900: 78th Vicinity to Newport Way Widening project. This report follows the guidance for mitigation reports provided in the *WSDOT Environmental Procedures Manual* (**WSDOT 2005a**). It contains descriptions of the project area's wetlands and streams, impacts to wetland and streams and their buffers, and the proposed mitigation for these impacts. Performance standards, post-construction monitoring, maintenance, and contingency plans are also discussed.

Project Description

The Washington State Department of Transportation (WSDOT) proposes improvements along State Route (SR) 900 between Newport Way and SE 83rd Place in Issaquah, Washington, from milepost (MP) 20.09 to MP 21.08, within Sections 20, 21, 29, and 32 of Township 24 North, Range 6 East, W.M (**Figures 1 and 2**).

SR 900 is a two- to three- lane asphalt, urban principal arterial in the widening area (**WSDOT 2004**). In the project vicinity SR 900 is currently undersized for the existing average daily travel of 15,000 vehicles. This is projected to increase to 28,000 vehicles by the year 2030 (**Claywell pers. comm. 2006**). The proposed project will ease congestion, improve safety, and serve growth in the land use and comprehensive plans of the adjacent communities. SR 900 routinely experiences congestion during weekday commute periods. The proposed SR 900 widening project has been designed to address these needs while minimizing environmental impacts.

WSDOT completed an analysis of design alternatives for areas where wetland and stream impacts will occur throughout the project. The majority of the roadway will be widened west to avoid and minimize wetland, stream, and floodplain impacts. Retaining walls will be incorporated into the project design in order to reduce the roadway footprint and minimize impacts to wetlands, streams, and residential properties. Additional analysis addressed current local, state, and federal environmental considerations intended to protect ESA-listed species, their habitat, and food resources.

WSDOT proposes to widen State Route (SR) 900 from two to five lanes between Newport Way and Talus Drive, and taper the widening back to the two lane existing configuration at SE 83rd Place in Issaquah (**Figure 2**). The project will also provide standard shoulders in the area along the right turn pocket on the westbound off-ramp from Interstate 90 to SR 900. In the SR 900 widening area, the project will construct two new general-purpose lanes with shoulders, a two-way left turn lane, a bike lane, and a multi-use pervious sidewalk. A total of 2.80 acres of new impervious surface will be created. Stormwater will be managed through a detention pond located on the east side of SR 900. Flows will be routed to the pond via an enclosed drainage system. Live storage within the pond will provide release rates that match pre-developed site flow rates for 50 percent of the 2-year, 25-year, and 100-year design storms. The pond will outfall to Tributary B. At the outlet to Tributary B, the area will have quarry spalls that will extend above the Ordinary High Water Mark (OHWM) to prevent scour at the outfall. All temporarily disturbed areas will be mulched and replanted with native vegetation. The project also includes bridge construction, culvert replacements, and mitigation construction listed below:

- The existing 42-foot wide Tibbetts Creek Bridge will be widened on both sides of the existing structure. Approximately 21 feet on the west, and 27 feet on the east side (along the creek centerline). The total length of the structure along the creek will be 106 feet since the alignment of the stream is at an angle to the road. Stream flow will be temporarily diverted around the work area. Although in-water work will take place, no equipment will be in the water. Work will be performed from the road or from the stream banks.
- A total of ten streams are located in the project corridor. Of these, five cross SR 900 and will require culvert/bridge replacements or extensions. Tibbetts Creek Bridge will be widened on both sides of the existing structure (see above). The culverts at Clay Pit Creek and West Fork Tibbetts Creek will be replaced with a longer culvert. The culverts at North Tributary and Tributary B will be extended. Tributary C will require roadside ditch realignment and Tributaries D and E will require modifications to the existing conveyance system. Tributary A and Tributary 0170 will not be altered. Of these streams, only five have documented fish use. The culverts to be replaced at Clay Pit Creek and West Fork Tibbetts Creek are fish-passage barriers. To assist in meeting fish passage requirements, the profile of the West Fork of Tibbetts creek will be regraded both upstream and downstream of the new box culvert, along with bank stabilization treatments. Approximately 2,789 linear feet of additional habitat will be accessible to salmonids following these two culvert replacements.
- Mitigation for wetland and stream impacts will occur in two locations: the floodplain of nearby Issaquah Creek in Lake Sammamish State Park (LSSP) and at Tributary B adjacent to the widening project on the east side of SR 900. Wetland mitigation will include creation of 1.74 acres of a Category II shrub-scrub wetland and enhancement of 0.11 acre of existing wetland. Because enhancement receives half the mitigation credit of creation, a total of 1.80 acres of mitigation credit will be available from this project. At the LSSP site, we will enhance 1.98 acres of wetland buffer adjacent to the created wetland and 0.25 acre of riparian buffer adjacent to Issaquah Creek. To mitigate for stream impacts, we will enhance approximately 516 linear feet (0.31 acre) of Tributary 0178a at the LSSP site and 233 linear feet (0.09 acre) of Tributary B. In addition, 0.58 acre of riparian buffer (0.38 acre of wet buffer and 0.20 acre of upland buffer) will be enhanced along Tributary B.

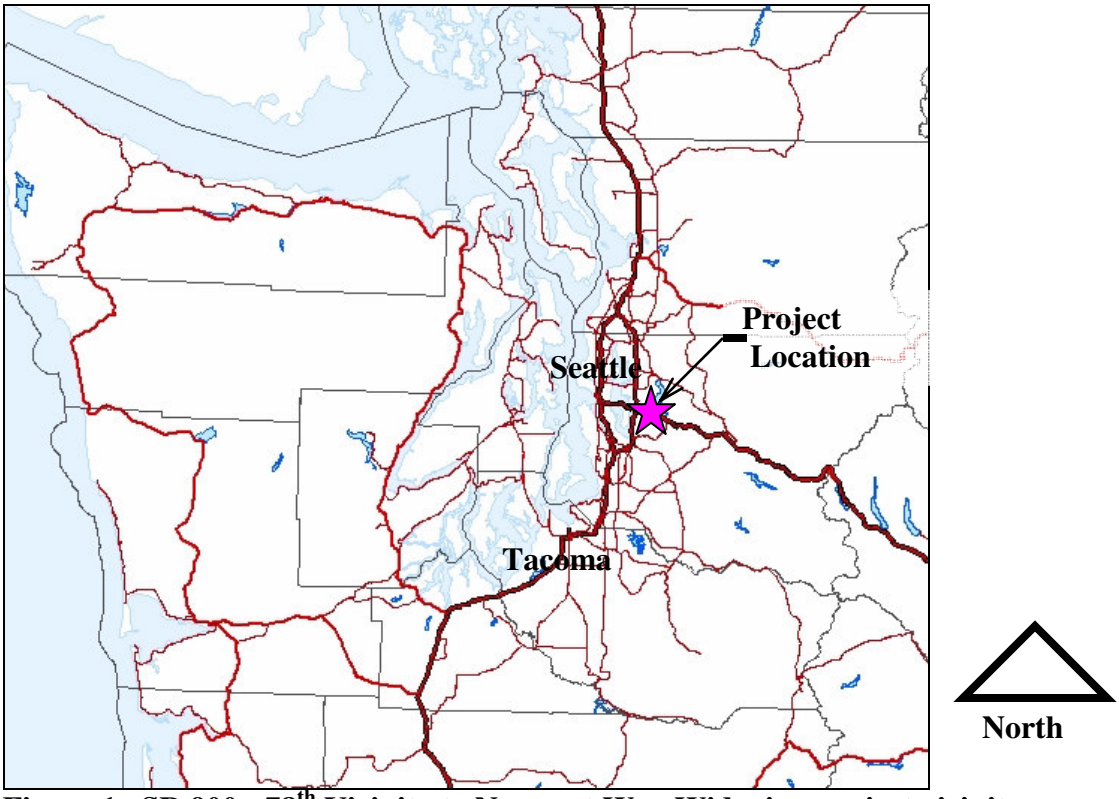

Figure 1. SR 900: 78th Vicinity to Newport Way Widening project vicinity map.

ECOLOGICAL ASSESSMENT OF THE PROJECT CORRIDOR

An ecological assessment of the potential impact area within the project corridor and results of the wetland delineation and stream surveys are described below. A general description of the surveyed wetlands and streams are discussed in this section. Functions for each of the wetlands and streams are also provided. A more detailed description of wetlands in the project corridor is provided in the *SR 900: 78TH Vicinity to Newport Way Widening Wetland Biology Report* (**WSDOT 2006**). A more detailed description of streams in the project corridor is provided in the *SR 900: 78TH Vicinity to Newport Way Widening Fisheries and Stream Survey Report* (**WSDOT 2005b**). Locations of wetlands and streams within the project corridor are shown on the plan sheets in Appendix A.

Project Area Setting

The project area is located within the Cedar-Sammamish watershed (Water Resources Inventory Area [WRIA] 8). The Cedar-Sammamish watershed is primarily located in King County and drains 692 square miles into the Lake Washington system (**City of Issaquah 2003**). Although a number of streams drain directly into Lake Washington, the majority of the watershed is divided between the Cedar River (WRIA 08-0299) and Sammamish River (WRIA 08-0057) basins. The SR 900 project area is divided between two sub-basins within the Sammamish River basin: Issaquah Creek (WRIA 08-0178) and Tibbetts Creek (WRIA 08-0169). Although Tibbetts Creek is not a tributary to Issaquah Creek, it is often included in the Issaquah Creek sub-basin, as they share a common floodplain (**Kerwin 2001**).

The widening corridor is located in Tibbetts Valley; SR 900 roughly parallels Tibbetts Creek through the valley until the creek turns northwest and crosses under SR 900 at Newport Way, flowing north into the south end of Lake Sammamish (**Figure 2**). Land use includes open space, agricultural, and low- to high-density residential. Residential developments are located atop Squak Mountain east of SR 900, although most of this area drains east into the Issaquah Creek sub-basin. Talus, a 168-acre master planned community developed by Rowley Enterprises, is under construction west of SR 900 on the east slope of Cougar Mountain. Construction of this urban village includes preservation of 387 acres of open space at the south end of the project area, connecting forested corridors on Squak Mountain and Cougar Mountain.

The ramp realignment area is located in the Tibbetts Creek alluvial floodplain at the southwest end of Lake Sammamish. Historically, dairies and other agricultural farms dominated this lower portion of the basin. Since the 1980s, the area has seen a substantial shift from agricultural and low-density residential with a small business community to substantial commercial and retail development. Today, business parks, shopping centers, I-90, and Lake Sammamish State Park all border the ramp realignment area.

Vegetated communities within the project area vary depending on the level of past disturbance and their location within the landscape. In general, highway right of way is dominated by reed canarygrass *(Phalaris arundinacea)* in the herbaceous areas, Himalayan blackberry *(Rubus armeniacus)*, rose *(Rosa* spp.), and willow *(Salix* spp.) in shrub-dominated areas, and red alder *(Alnus rubra)* and black cottonwood *(Populus balsamifera)* in forested areas.

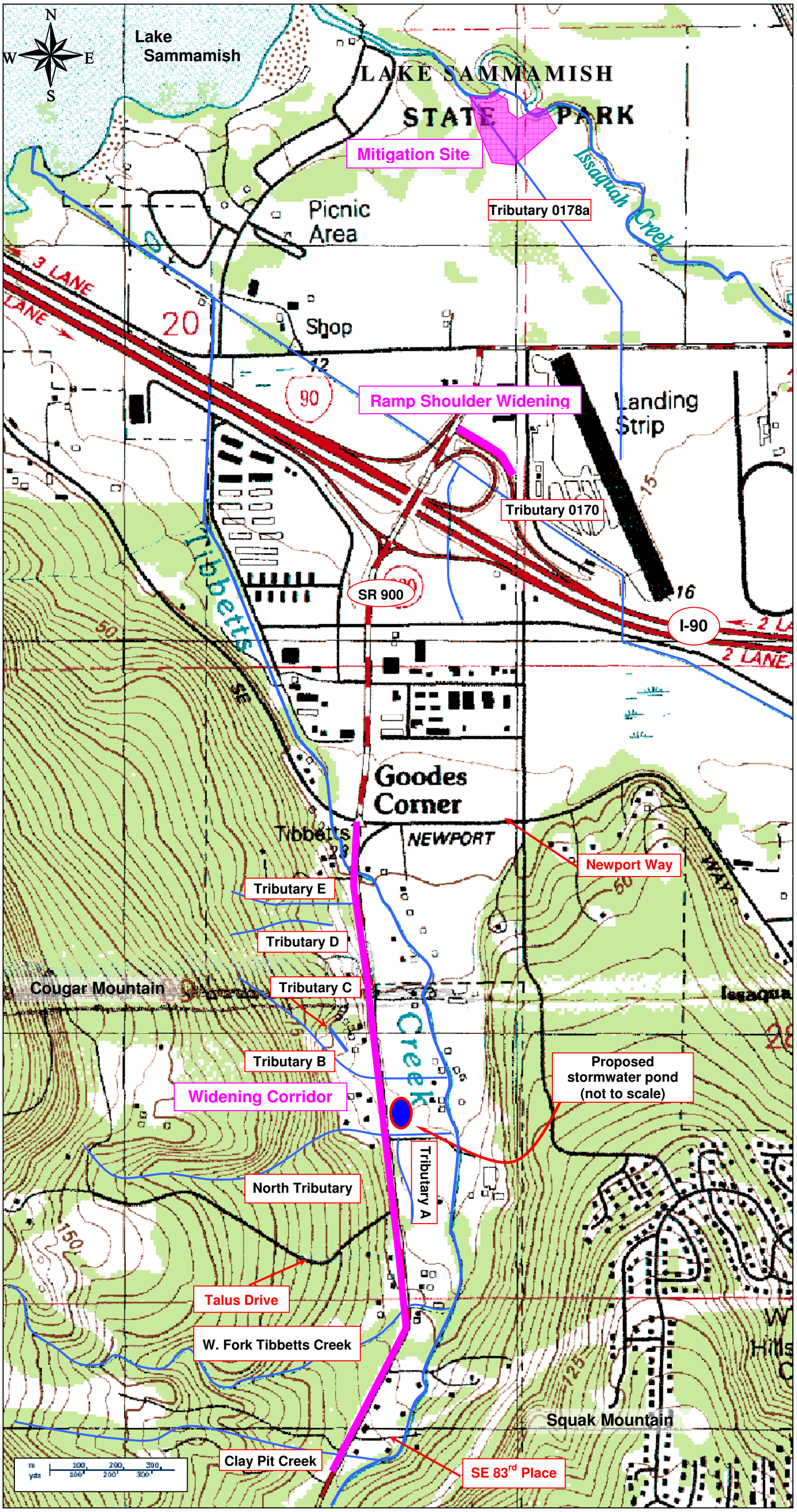

Figure 2. SR 900 Newport Way to 78th Vicinity project areas (pink) and associated streams.

The entire project lies within the western hemlock vegetation zone of western Washington (**Franklin and Dyrness 1988**). A majority of the native vegetation has been removed throughout the project corridor due to agricultural activities with small undeveloped, upland and wetland forested/shrub patches generally associated with water bodies. Disturbed upland areas often consist of planted pasture grasses and/or noxious weeds such as timothy *(Phleum pretense)*, tall fescue *(Schedonorus phoenix*, née *Festuca arundinacea)*, red fescue *(Festuca rubra)*, common velvetgrass *(Holcus lanatus)*, dandelion *(Taraxacum officinale*), white clover *(Trifolium repens)*, orchardgrass *(Dactylis glomerata)*, fireweed *(Chamerion angustifolium)*, Stork's bill *(Erodium cicutarium)*, colonial bentgrass *(Agrostis capillaris)*, pearly everlasting *(Anaphalis margaritcea)*, hairy cats ear *(Hypochaeris radicata)*, common tansy *(Tanacetum vulgare)*, English plantain *(Plantago lanceolata)*, scattered barnyard grass *(Echinochloa crusgalli)*, fowl bluegrass *(Poa palustris)*, and meadow foxtail *(Alopercus pratensis)*. Upland (often riparian) forested areas commonly consist of deciduous species such as black cottonwood, red alder, paper birch *(Betula papyrifera)*, and big-leaf maple *(Acer macrophyllum)*, with coniferous species of Douglas fir *(Pseudotsuga menziesii)* and western red cedar *(Thuja plicata)*. Understory species include Himalayan blackberry, evergreen blackberry *(Rubus laciniatus)*, vine maple *(Acer circinatum)*, red elderberry *(Sambucus racemosa)*, salal *(Gaultheria shallon)*, snowberry *(Symphoriocarpus albus)*, Indian plum *(Oemleria cerasiformis)*, and salmonberry *(Rubus spectabilis)*. Much of the area east of SR 900 in Tibbetts Valley is wetland. Wetland plant communities range from reed canarygrass, soft rush *(Juncus effusus)*, and buttercup-dominated *(Ranunculus* spp.) fields to forested wetlands with willow species, red alder, and a healthy understory of red-osier dogwood *(Cornus sericea)*, salmonberry, water parsley *(Oenanthe sarmentosa)*, and skunk cabbage *(Lysichiton americanum)*.

Soils

The King County soil survey identifies six soil types within the project area: Alderwood gravelly sandy loam, 15 to 30 percent slopes; Bellingham silt loam; Everett gravelly sandy loam, 5 to 15 percent slopes; mixed alluvial land; Puget silty clay loam; and Sammamish silt loam (**USDA, SCS 1973**).

Alderwood gravelly sandy loams (AgD) mapped in the project areas are moderately well drained and found on 15 to 30 percent slopes. They formed in glacial deposits, under conifers. This soil only comprises up to 30 percent of the soils where it is mapped; it often includes up to 25 percent Everett, and up to 2 percent Bellingham, Norma, or Seattle soils in depressions. In the Squak Mountain and Tiger Mountain area, this soil can be 25 percent Beausite and Ovall soils. A representative profile of this soil is a very dark brown, dark brown, and grayish brown gravelly sandy loam approximately 27 inches deep. The surface layer is underlain by a grayish-brown, glacial till 60 inches thick.

Bellingham silt loams (Bh) are poorly drained soils that formed in alluvium under grass and sedges. They are typically found in rounded and elongated strips with slopes less than two percent. Bellingham silt loams can include small areas of Alderwood, Everett, and Seattle soils. A typical profile includes a black to very dark grayish brown soils underlain by a grayish brown, olive gray, or gray layer. The B horizon is often silty clay loam and heavy silt loam with a few thin layers of loamy sandy or sandy loam.

Everett gravelly sandy loams (EvC) mapped in the project area are found on terraces and

terrace fronts on five to 15 percent slopes. These soils formed in glacial outwash deposits, under conifers and are somewhat excessively drained. Very gravelly sand is found below Everett gravelly sandy loams from approximately 18 to 36 inches. Surface and subsurface layer soils are black to brown and underlain by a gravelly to very gravelly sandy loam about 32 inches thick. The mapped soils in this area make up no more than 25 percent of the total acreage; inclusions include Alderwood and Neilton soils.

Mixed alluvial land (Ma) is comprised of alluvial soils in areas too small to depict separately at the scale used by NRCS to map soils. This land is found on slopes two percent or less. Soil texture and drainage is variable; texture ranges from sand to gravelly sand to silty clay loam, and drainage ranges from well drained to very poorly drained. Stream overflow hazard is severe.

Puget silty clay loams (Pu) found in the project area are formed in alluvium under sedges and grass. These soils are poorly drained and typically found in small depressions in river valleys, with slopes zero to one percent. A typical profile includes a mottled, dark grayish-brown and grayish-brown silty clay loam approximately 45 inches deep.

Sammamish silt loams (Sh) are somewhat poorly drained soils that formed in alluvium in stream valleys. Those mapped in the project area are nearly level, irregularly shaped areas. A representative profile of these soils includes a very dark grayish-brown, dark grayish-brown, and olive gray, stratified silt loam, loamy sand, and fine sandy loam 60 inches or more deep.

Of the six soils mapped in the project area, all but Alderwood gravelly sandy loam and Everett gravelly sandy loam are considered hydric (**USDA, NRCS 2005**).

ECOLOGICAL ASSESSMENT OF THE WETLAND IMPACT SITES

This section describes the unavoidable wetland and wetland buffer impacts from construction of the SR 900: 78th Vicinity to Newport Way widening project. Impacts are described by each wetland with a discussion of the specific roadway improvement causing the impact, the vegetation lost with this impact, and the related loss of functions. These lost functions are considered direct impacts and are of a permanent nature.

Also included is a discussion of impacts to buffers and temporary impacts to wetlands and their buffers. Impacts are considered temporary when only vegetation is cut and no other disturbance occurs during construction. Grubbing or soil disturbance is considered a permanent impact. Roadway improvement projects can also indirectly impact wetlands. This type of impact occurs when a permanent wetland impact results in reduction or elimination of wetland functions in the remaining wetland area. However, there are no indirect wetland impacts associated with this project.

Wetlands were delineated using the Routine Determination Method outlined in the *Washington State Wetland Identification and Delineation Manual* (**Ecology 1997**) and *Corps of Engineers Wetland Delineation Manual* (**Environmental Laboratory 1987**). WSDOT biologists conducted wetland verifications and wetland delineations of nine wetlands along the project

corridor over a two-year period due to right of entry issues and revised project descriptions. Delineations or verifications occurred December 2003, May and September 2004, and April through July 2005, with additional wetland delineations conducted in March, July, August, October, and November of 2005. In addition, biologists delineated two wetlands within the LSSP mitigation site study area on August 2 and 3, 2005 and November 15 and 21, and December 4, 2006. Complete wetland descriptions including functional analyses can be found in the Wetland Biology Report (**WSDOT 2006**) and the Phase II Mitigation Site Wetland Delineation Memo (**Appendix B**).

Wetland 1

Wetland 1 is a 0.81-acre, shrub and forest dominated wetland near the southern terminus of the widening corridor, on the east side of SR 900, in the Tibbetts Creek Valley (**Appendix A, Sheet 3**). The wetland is a Category II per the Ecology rating system (2004) and a depressional outflow per the Hydrogeomorphic (HGM) Classification system (Brinson 1993).

Proposed Impacts

Permanent Impacts

Wetland

Road widening in this area will fill 0.03 acre of wetland. Wetland vegetation affected by the widening is predominantly a dense herbaceous layer consisting of reed canarygrass, blackberry, and lady fern *(Athyrium filix-femina)*, with a few individual Pacific willow present.

The filling of 0.03 acre of existing wetland will reduce flood storage capacity and will result in some loss of flood flow alteration functions. Removal of the herbaceous vegetation adjacent to the highway will reduce the wetland's ability to trap and filter pollutant laden sediments which will result in a reduction of sediment and toxicant removal functions. Since the highway improvements will treat roadway runoff in this area, the loss of this function is not considered to be significant. The loss of deciduous herbaceous, shrub, and tree species in the wetland will reduce litter and other organic contributions which will result in a reduction of organic matter production. Similarly, the loss of this vegetation will reduce wildlife food and cover capabilities which will result in a reduction of general wildlife habitat functions. However, given the close proximity to the roadway, and the minor amount of tree and shrub vegetation removed, impacts to this function are not considered to be noteworthy.

Buffer

Road widening in this area will remove 0.10 acre of wetland buffer. Buffer vegetation impacted is dominated by reed canarygrass, field horsetail *(Equisetum arvense)*, and blackberry, with red alder, red elderberry, hazelnut *(Corylus cornuta)*, Indian plum, and salmonberry present. Buffer vegetation between SR 900 and the wetland provides some water quality functions and some buffering and screening functions.

Temporary Impacts

Construction of the roadway improvements will temporarily impact 0.03 acre of wetland and 0.03 acre of wetland buffer vegetation. The vegetation temporarily impacted is similar to the

directly impacted vegetation previously described. Temporary removal of wetland vegetation will result in short-term loss of water quality and some organic matter production functions. The cutting of deciduous shrub vegetation in the wetland will result in long-term loss of some organic matter production and general wildlife habitat functions. The cutting of herbaceous buffer vegetation will result in the short-term loss of water quality functions. The cutting of shrub and tree vegetation in the buffer will result in the long-term loss of screening and buffering functions.

Wetland 2

Wetland 2 is an 8.27-acre emergent wetland on the east side of SR 900 within the Tibbetts Creek Valley (**Appendix A, Sheets 6-9**). It is bordered on the north by the Kelly Ranch driveway, on the west by agricultural fields and SR 900, and on the east by rural residences and Tibbetts Creek. Most of Wetland 2 has been or is currently used for agriculture, horse grazing, or has been converted to athletic field or large, expansive residential lawns. Wetland 2 is a Category III wetland per the Ecology rating system (2004) and contains both depressional outflow and riverine HGM components.

Proposed Impacts

Permanent Impacts

<u>*Wetland*</u>
Stormwater pond, roadway widening, and access road construction will fill 0.43 acre of emergent wetland, and stream restoration along Tributary B will permanently impact 0.06 acre of wetland, for a total permanent wetland impact of 0.49 acre. Wetland vegetation affected by the improvements is dominated by reed canarygrass, creeping buttercup *(Ranunculus repens)*, and soft rush in certain areas and field horsetail and velvetgrass in others. Wetland vegetation along Tributary B also includes salmonberry and a few Sitka willow *(Salix sitchensis)*.

The filling of a portion of this emergent wetland will result in a reduction of flood storage volume. The loss of the herbaceous vegetation, particularly that located adjacent to the roadway, will result in a reduction of sediment and toxicant removal functions. The loss of the deciduous vegetation adjacent to the tributary to create the access road will reduce organic matter contributions. Given the on-going agricultural practices in a significant part of the impacted wetland, however, these functions are already somewhat impaired.

Amphibian habitat functions will be reduced with the loss of the emergent vegetation in the wetland; however there is minimal thin stemmed vegetation in this area. The impact footprint within areas of permanent standing water or seasonal inundation also contribute to the loss of invertebrate habitat. The wetland does provide some wildlife habitat functions which will be reduced by the project, however, the lack of multiple Cowardin classes and vegetation diversity, the developed buffer area, proximity to development, and on-going agricultural activities limits the wetland's ability to provide these functions. Approximately 0.56 acre of riparian buffer of Tributary B will be revegetated and enhanced as part of the stream mitigation component. This work should improve conditions for invertebrate and salmonid habitat, general wildlife habitat, flood flow alteration, sediment and toxicant removal, erosion control, organic material production, and native plant richness.

Buffer

Road widening, shoulder width expansion, stormwater pond, and pond access road construction will impact 0.39 acre of wetland buffer. Buffer vegetation impacted by the project varies depending on the location of the impact. Roadway widening between the SR 900/Talus Drive intersection and the next driveway contains three plant communities; pasture grass dominated in the southern portion; red elderberry and evergreen blackberry dominated in the central portion; and red alder, salmonberry, red elderberry, evergreen blackberry, and bracken fern *(Pteridium aquilinum)* in the northern portion. The buffer vegetation impacted by the stormwater pond construction is dominated by commercially farmed ornamental bulbs and wild flowers with hydroseed grasses and a few small junipers adjacent to the roadway.

Removal of buffer vegetation will result in a loss of buffering and screening functions. Buffer vegetation between SR 900 and the wetland is predominantly herbaceous vegetation providing primarily water quality functions.

Temporary Impacts

Roadway and stormwater pond construction will temporarily impact 0.24 acre of wetland and 0.08 acre of wetland buffer vegetation. The vegetation affected by construction is similar to the buffer communities previously described in the direct impact section. Cutting herbaceous buffer vegetation will result in the short-term loss of water quality functions. Cutting shrub and tree vegetation within the buffer will result in the long-term loss of screening and buffering functions.

Wetland 3

Wetland 3 is a 0.57-acre wetland located on a slope west of SR 900, south of Goode Place NE, and north of SE 75th Street, immediately east of two newly-constructed stormwater ponds (**Appendix A, Sheet 10**). The wetland originates from seeps and a small, intermittent stream (Tributary B) that drains the steep hillside west of SR 900. The wetland is bordered on the east by SR 900, on the west by the stormwater ponds, and on the north and south by driveways. The wetland has been altered by construction of the stormwater ponds, and has been recently enhanced with plantings of native shrub species. Wetland 3 is culverted under SR 900 and emerges as Tributary B on the east side of the highway. Wetland 3 is rated as Category III under the Ecology rating system (2004), PSS and PEM per USFWS (Cowardin et al. 1979), and contains both depressional outflow and slope HGM components.

Proposed Impacts

Permanent Impacts

Wetland

Roadway widening will fill 0.14 acre of emergent wetland. Vegetation affected by the widening is predominantly creeping buttercup with areas of reed canarygrass, soft rush, cattail *(Typha latifolia)*, and small-fruited bulrush *(Scirpus microcarpus)*. A pocket of scrub-shrub vegetation will be affected by the construction and includes Pacific willow *(Salix lucida)*, Sitka willow, and red alder.

Tributary B drains into the wetland, which is adjacent to Tributary C. Wetland 3 is a combined slope and shallow depressional wetland; filling 0.14 acre of Wetland 3 will reduce flood storage volume, resulting in the loss of some flood flow alteration functions. The loss of the herbaceous

vegetation along the roadway will result in the loss of sediment entrapment and sedimentation, filtration, absorption, and decomposition capabilities. This will result in the loss of some sediment and toxicant removal functions, however since roadway runoff will be treated and areas draining into the wetland are undeveloped, the loss of this function is not considered to be noteworthy. The removal of herbaceous and deciduous shrub vegetation in the wetland will decrease the present levels of organic matter contributions to the Tributary B. Invertebrate habitat functions will also decrease with the reduction in the area of seasonal standing water and with the loss of emergent vegetation. Wildlife habitat functions may slightly diminish, however given the development surrounding the impacted wetland area and the dominance of herbaceous vegetation, non-native invasive species, and immature tree species, this should not be significant.

Buffer

The project will permanently impact 0.11 acre of buffer area. The impacted buffer community is dominated by Himalayan blackberry mixed with red alder and red cedar with bull thistle *(Cirsium vulgare)* and miscellaneous grasses in the understory. At the entrance to the stormwater pond access road, sea tomato rose *(Rosa rugosa)*, vine maple, snowberry, Oregon grape *(Mahonia aquifolium)*, and thimbleberry *(Rubus parviflorus)* have been planted. Only a small portion of this planted community will be affected.

The buffer width along SR 900 is minimal and vegetation in this area consists primarily of non-native invasive and herbaceous species. As a result, the buffer provides little in the way of buffering and screening functions. The herbaceous buffer vegetation between SR 900 and the wetland provides some water quality functions, however the reduced width of the buffer in this area severely limits its ability to perform this function.

Temporary Impacts

Roadway widening will temporarily impact 0.04 acre of wetland and 0.01 acre of buffer vegetation. The wetland vegetation affected by construction consists primarily of emergent vegetation, although some scrub-shrub vegetation will also be affected. The impacted vegetation is identical to the community described previously. The buffer community temporarily impacted for construction is primarily blackberry with some herbaceous understory. Cutting herbaceous buffer vegetation will result in the short-term loss of water quality functions.

Wetland 5

Wetland 5 is a 1.82-acre, multi-vegetation community wetland on the east side of SR 900, south of Newport Way (**Appendix A, Sheet 13**). It is bordered on the north and east by Tibbetts Creek and on the south by the driveway for Tibbetts Creek Manor. Wetland 5 was graded and planted in 2003 and 2004 as part of the Tibbetts Creek Greenway restoration project. Wetland 5 also includes a part of the Tibbetts Creek Manor's lawn, which is regularly mowed, and a backwater channel that was constructed as part of the restoration project. Wetland 5 is rated as Category III under the Ecology rating system, PFO and PSS per USFWS, and contains both riverine and depressional HGM components.

Proposed Impacts

Permanent Impacts

Wetland
There are no proposed permanent impacts to this wetland.

Buffer
Roadway widening will impact 0.05 acre of buffer area. Vegetation affected by the impact is primarily mowed grass. A strip of ornamental herbaceous and tree species that will also be impacted is found along SR 900 and includes iris *(Iris* sp.), cinquefoil *(Potentilla fruticosa)*, blackeyed susan *(Rudbeckia hirta)*, false spirea *(Astilbe* sp.), and sweet gum *(Liquidambar styraciflua* 'Rotundiloba'). Removal of this buffer area will reduce water quality functions, however the regular mowing reduces the ability of the grass to perform these functions. Screening functions are limited in this area since the herbaceous species are present seasonally and the tree species are immature.

Temporary Impacts

Roadway widening construction will temporarily impact 0.09 acre of buffer vegetation. Vegetation temporarily impacted is identical to the previously mentioned plant community. Since the vegetation impacted is predominantly herbaceous, no significant loss of buffer functions is anticipated.

Wetland 6

Wetland 6 is a 0.09-acre scrub-shrub and emergent wetland located on both the north and south banks of Tibbetts Creek, approximately 15 feet east of the SR 900 Bridge over the creek (**Appendix A, Sheets 13 and 14**). It is bordered on the north by a narrow band of trees and an old gravel access road, on the west by SR 900, and on the south and east by upland vegetation. The area surrounding and including the wetland has been graded and planted in 2003 and 2004 as part of the Tibbetts Creek Greenway restoration project. Wetland 6 is rated as Category III under the Ecology rating system and contains both slope and riverine HGM components.

Proposed Impacts

Permanent Impacts

Wetland
Roadway widening will fill 0.02 acre of predominantly scrub-shrub wetland. Wetland vegetation affected is dominated by red alder, Pacific willow, and Sitka willow in the canopy with reed canarygrass as the dominant understory plant. Other species present in the impacted area includes red-osier dogwood and salmonberry.

The filling of 0.02 acre of wetland will result in a reduction of flood storage volume which will reduce flood flow alteration functions. However since the wetland in this location does not provide much storage volume, the loss of this function is considered minor. Erosion control and shoreline stabilization functions will be reduced with this impact. However this function loss is considered minor due to the small size of the wetland in relation to the channel and the corresponding minimal size of the impact area. The loss of the deciduous scrub-shrub vegetation adjacent to the creek will reduce organic production and export functions. The impact area is

perpendicular to the creek which reduces the extent of this functional loss. Given that the impact area has more than one wetland community, is located adjacent to the creek, and the riparian corridor possesses some mature vegetation, the impact to Wetland 6 will result in the loss of general habitat functions. Finally, the impact area will culvert a portion of the creek and fill emergent wetland area thereby reducing aquatic invertebrate habitat functions.

Buffer
Roadway improvements will not impact wetland buffer, however, stream buffer will be impacted. This is described in the stream impacts section of this report.

Temporary Impacts

Roadway widening will temporarily impact less than 0.01 acre of wetland vegetation. The roadway improvements will also temporarily impact stream buffer which is discussed in the stream impact section of this report. The wetland vegetation affected by construction consists primarily of scrub-shrub vegetation, identical to the community described previously.

Wetland 7

Wetland 7 is a 0.06-acre, depressional wetland in the southwest quadrant of the SR 900/Newport Way intersection (**Appendix A, Sheet 15**). It is bordered on the east by SR 900 and on the north by Newport Way. A stand of second-growth conifers borders the wetland to the south and west. Approximately 81 ft^2 of Wetland 7 was filled during the SR 900 Phase 1 project. Its buffer has been replanted with native shrub species.

Proposed Impacts

Permanent Impacts

Wetland
Roadway widening associated with intersection improvements will result in a total take (0.06 acre) of the emergent wetland. Vegetation impacted by the widening is dominated by reed canarygrass and colonial bentgrass. The wetland is located adjacent to the highway and receives stormwater runoff. As such, the loss of this herbaceous community will reduce sediment and toxicant removal functions. Since the impacted wetland area is small and since the roadway improvements will treat highway runoff, impacts to this function are considered to be minor. The wetland HGM classification is closed depressional and does provide some stormwater storage volume. Removal of this wetland will reduce flood flow alteration function; however, this loss is not noteworthy due to the small volume provided. The seasonal standing water and the presence of herbaceous vegetation provide aquatic invertebrate habitat functions. Loss of this vegetation in combination with standing water will reduce this function.

Buffer
There will be no permanent buffer impacts.

Temporary Impacts

There will be no temporary impacts to the wetland or wetland buffer area.

Wetland 8

Wetland 8 is a 0.06-acre, drainage ditch in the southeast quadrant of the SR 900/Newport Way intersection (**Appendix A, Sheet 16**). It is bordered on the east by a fill slope for a park and ride lot, on the west by SR 900, and on the north by Newport Way. The buffer of Wetland 8 was disturbed during the SR 900 Phase 1 project, and has been replanted with native shrub species. Wetland 8 is classified as a Category III and depressional outflow wetland under the Ecology and HGM classification systems, respectively.

Permanent Impacts

Wetland

Roadway widening associated with intersection improvements will fill <0.01 acre (202 ft^2) of emergent wetland. Vegetation impacted by the widening is dominated by reed canarygrass, creeping buttercup, and colonial bentgrass. The wetland is located adjacent to the highway and receives stormwater runoff. Loss of a portion of this herbaceous community will reduce sediment and toxicant removal functions. Since the impacted wetland area is small and since the roadway improvements will treat highway runoff, impacts to this function are considered to be minor.

Buffer

Roadway improvements will impact 0.06 acre of buffer area. Buffer vegetation impacted is predominantly a mixture of immature ornamental and native plant shrub and tree species installed as part of the restoration of SR 900 Phase 1 impacts. Dominant vegetation includes rockrose *(Cistus sp*.) and kinnikinnick *(Arctostaphylos uva-ursi)*, with some Pacific ninebark, thimbleberry, and western red cedar. The existing buffer functions are minimal due to the size and age of the plant material.

Temporary Impacts

The roadway improvement construction will impact 0.01 acre of wetland and 0.04 acre of buffer area. Wetland vegetation temporarily impacted includes reed canarygrass, creeping buttercup, and colonial bentgrass. Temporary removal of this vegetation will reduce primarily water quality and invertebrate habitat functions. Temporary buffer impacts will remove similar vegetation as previously mentioned. Temporary removal of the buffer vegetation is not likely to affect existing buffer functions due to the size of the vegetation.

Wetland 9

Wetland 9 is a 0.58-acre swale in the SR 900/I-90 interchange. It is located in the northeast corner of the interchange immediately north of the westbound I-90 off-ramp to SR 900. Wetland 9 is a remnant wetland, bordered on the south by the off-ramp, on the north by a commercial development, and on the west by SR 900. Wetland 9 is classified as a Category III wetland under the Ecology rating system and is a depressional outflow per the HGM classification system.

Proposed Impacts

Permanent Impacts

Wetland
There are no permanent impacts associated with this wetland.

Buffer
There are no permanent impacts associated with this wetland buffer.

Temporary Impacts

There are no temporary impacts associated with this wetland.

Wetlands in Lake Sammamish State Park

Wetlands 1 and 2 are located in the Lake Sammamish State Park, in King County's Urban Growth Area. Wetland 1 is an approximate 10-acre PEM/PSS/PFO wetland complex located in the large open field south of Issaquah Creek and extends west of the mitigation area as a shrub/forest community (**Appendix A, Sheets M1 and M2**). Wetland 1 is classified as a Category II wetland under the Ecology rating system and is a depressional outflow per the HGM classification system. Wetland 2 is an approximate 0.07-acre PEM wetland located on either side of a small tributary (Tributary 0178a) that drains to Issaquah Creek. It is classified as a Category III wetland under the Ecology rating system and is a depressional outflow per the HGM classification system.

Proposed Impacts

Permanent Impacts

Wetland
There are no permanent impacts associated with these wetlands.

Buffer
There are no permanent impacts associated with these wetland buffers.

Temporary Impacts

WSDOT will need to temporarily widen two existing grass paths located in the LSSP in order to create a temporary access road to each side of the wetland mitigation site to get large construction vehicles to the site. Access to construct the mitigation site at the LSSP will result in temporary impacts to the wetland and buffer of Wetland 1 (see **Appendix A, Sheets M1 and M2**). These two access routes will temporarily impact 0.12 acre of wetland and 0.40 acre of wetland buffer. The vegetation impacted is primarily pasture grasses and non-native invasive species, with some minor trimming of shrubs and tree branches. Access roads will be located on the existing path in most areas of the LSSP. In two locations, however, the access road will cross through a patch of vegetation that primarily consists of Himalayan blackberry. The paths through the vegetation were chosen so as to minimize impacts to native shrubs and trees. These areas will have the same revegetation plans as other temporary impact areas in the project. There are no temporary impacts to Wetland 2.

Impact Summary

Permanent Impacts

A total of 0.75 acre of permanent wetland impacts due to fill or excavation will occur with partial wetland fill of Wetlands 1, 2, 3, 6, and 8 and total fill of Wetland 7 (**Table 1**). The impacts will occur primarily to Ecology and Issaquah Category III wetland, totaling 0.71 acre (96% of the impacted area) with a lesser amount of Category II impact, totaling 0.03 acre (4% of the impacted area; **Table 2**). The principal wetland community impacted per USFWS classification is palustrine emergent (PEM) wetland with impacts totaling 0.56 acre (75% of the impacted area), with the remaining consisting of palustrine scrub-shrub (PSS) wetland with impacts totaling 0.19 acre (25% of the impacted area; **Table 2**). Impacts per hydrogeomorphic (HGM) classification consist primarily of depressional outflow wetlands, totaling 0.53 acre (71% of impacted area). Other HGM classes impacted include depressional outflow with slope wetland components, depressional closed, and riverine with slope wetland components, totaling 0.14 acre (19% of the impacted area), 0.06 acre (8% of the impacted area), and 0.02 acre (2% of the impacted area), respectively (**Table 2**). **Table 3** shows the functions of each wetland that are impacted by project construction.

A total of 0.70 acre of permanent impact will occur to the buffers of Wetlands 1, 2, 3, 5, and 8 (**Table 1**). Permanent buffer impacts occur when vegetation is removed and soils are disturbed.

Temporary Impacts

Temporary impacts to both wetlands and buffers consist of cutting vegetation to enable project construction. Grubbing or removal of roots or stumps is beyond the intent of a temporary impact and is listed as a permanent impact. Temporarily wetland impacts will occur in Wetlands 1, 2, 3, 6, 8, and Wetland 1 in the LSSP, for a total of 0.44 acre (**Table 1**). Temporary wetland buffer impacts occur in Wetlands 1, 2, 3, 5, 8, and Wetland 1 in the LSSP, and totals 0.64 acre.

Vegetation in these areas that will be temporarily impacted in the LSSP consists primarily of pasture grasses and non-native invasive species. Access roads will be located on the existing path in most areas of the Park. In two locations, however, the access road will cross through a patch of vegetation that primarily consists of Himalayan blackberry. The paths through the vegetation were chosen so as to minimize impacts to native shrubs and trees.

Table 1. Wetland and wetland buffer impacts.

Wetland	Wetland Area[a]		Wetland Rating			Wetland Impacts						Buffer Impacts			
							Direct Impact			Temporary Impact		Permanent Impact		Temporary Impact	
	(sq ft)	(acre)	HGM[b]	USFWS[c]	Ecology/ Issaquah	USFWS[d]	(sq ft)	(acre)	% Impact	(sq ft)	(acre)	(sq ft)	(acre)	(sq ft)	(acre)
1	35,354	0.81	Do	PFO/PSS	II	PSS/PEM	1,447	0.03	4%	1,212	0.03	4,148	0.10	1,192	0.03
2	360,117	8.27	Do	PEM	III	PEM	21,275	0.49	6%	10,490	0.24	16,957	0.39	3,508	0.08
3	24,625	0.57	S + Do	PSS/PEM	III	PSS/PEM	6,096	0.14	25%	1,555	0.04	4,805	0.11	364	0.01
5	79,210	1.82	Rft + Do	PFO/PSS	III	na	0	0.00	0%	0	0.00	2,046	0.05	4,009	0.09
6	3,987	0.09	Rft + S	PSS/PEM	III	PSS/PEM	758	0.02	19%	383	0.01	0	0.00	0	0.00
7	2,756	0.06	Dc	PEM	III	PEM	2,756	0.06	100%	na	na	na	na	na	na
8	2,628	0.06	Do	PEM	III	PEM	202	<0.01	7%	450	0.01	2,615	0.06	1,575	0.04
1 (LSSP)	na	~10.00	Do	PFO/PSS/PEM	II[e]	na	0	0.00	0	5,291	0.12	0	0.00	17,358	0.40
TOTALS							**32,534**	**0.75**	**-**	**19,381**	**0.44**	**30,571**	**0.70**	**28,006**	**0.64**

a. Wetland sizes for those wetlands, which extend off the investigated area were estimated visually and through aerial photography.
b. Wetlands by HGM classification (Brinson 1993): Dc= depressional closed, Do=depressional outflow, Rft=riverine flow-through, S= slope.
c. Wetlands by USFWS Cowardin classification (1979): PEM=palustrine emergent, PSS=palustrine scrub-shrub, PFO=palustrine forested.
d. Wetland community impact
e. Ecology and King County CAO wetland rating

Table 2. Wetland impact summary by HGM, USFWS, and Ecology/Issaquah classification criteria.

Criteria	Wetland Class	Impact Area [a]		Impact Percent
		Sq. Ft.	Ac.	
HGM	riverine + slope	758	0.02	2%
	depressional outflow + slope	6,096	0.14	19%
	depressional outflow	22,924	0.53	71%
	depressional closed	2,756	0.06	8%
	Subtotal	32,534	0.75	100%
USFWS	PEM	24,233	0.56	75%
	PSS	8,301	0.19	25%
	PFO	0	0.00	0%
	Subtotal	32,534	0.75	100%
Ecology/ Issaquah	I	0	0.00	0%
	II	1,447	0.03	4%
	III	31,087	0.71	96%
	IV	0	0.00	0%
	Subtotal	32,534	0.75	100%

a Total acreage of wetland impact was determined by converting the square footage of the total wetland impacts into acres and rounded to the nearest 0.01.

Table 3. Wetland functions affected by direct wetland impacts.

Function/Value[a]	Wetland					
	1	2	3	6	7	8
Flood Flow Alteration	X	X	X	X	X	X
Sediment Removal	X	X	X	X	X	X
Nutrient and Toxicant Removal	X	X	X	X	X	X
Erosion Control and Shoreline Stabilization		X	X	X		
Production & Export of Organic Matter	X	X	X	X		X
General Habitat Suitability	X	X	X	X		
Habitat for Aquatic Invertebrates		X	X	X	X	X
Habitat for Amphibians		X				
Habitat for Wetland-Associated Mammals						
Habitat for Wetland-Associated Birds						
General Fish Habitat		X				
Native Plant Richness						
Educational or Scientific Value						
Uniqueness and Heritage						

[a] WSDOT 2000

ECOLOGICAL ASSESSMENT OF THE STREAM IMPACT SITES

This section describes the unavoidable stream and stream buffer impacts from construction of the SR 900: 78th Vicinity to Newport Way Widening project.

Biologists delineated and classified ten streams in the project area (**Table 4**). Many of these streams bisect or originate in wetlands delineated in the project area (see **Appendix A**). SR 900 was used as a landmark for determining stream classes within the project corridor; many streams change class depending on whether the reach is upstream or downstream of the highway. Some stream classes are only noted for a stream on one side of SR 900 because the stream does not flow to the opposite side of the highway; it either flows into a wetland or a catch basin. Stream classes within the corridor vary primarily based on the absence or presence of salmonids. In general, streams are narrow and incised high-gradient channels upstream (west) of SR 900, and low-gradient, channelized systems downstream (east) of SR 900 and in the SR 900/I-90 interchange. Human disturbance of streams is most apparent in the SR 900/I-90 interchange and east of SR 900 in the widening area. These alterations have hydrologically isolated many of the streams from adjacent wetlands, eliminating regular overbank flooding and the interaction of these resources. WSDOT biologists completed a stream survey report for the project that details salmonid habitat, fish use, and streamside vegetation for each stream (**WSDOT 2005b**).

Over the past five years, local agencies have completed habitat improvement projects along Tibbetts Creek as part of the Tibbetts Creek Greenway project in an effort to improve salmonid habitat in the system. New plantings, grading, and habitat piles dot the banks of the creek for most of the reach in the widening corridor. Existing wetlands in the widening corridor have also been recently enhanced as part of wetland mitigation by private entities. Wetland creation and

enhancement was previously discussed as it related to individual wetlands delineated in the project area.

Table 4. Classification of project area streams.

Stream	City of Issaquah[a]			
	Stream Classification		Buffer Width (ft)	
	Upstream of SR 900	Downstream of SR 900	Upstream of SR 900	Downstream of SR 900
Clay Pit Creek (WRIA 08-0172)	2s	2s	100	100
WF Tibbetts Creek (WRIA 08-0171)	2	2s	75	100
Tributary A	-	2s	-	100
North Tributary	2	2s	75	100
Tributary B	3	2s	50	100
Tributary C	3	-	50	-
Tributary D	3	-	50	-
Tributary E	3	-	50	-
Tibbetts Creek (WRIA 08-0169)	2s	2s	100	100
Tributary 0170 (WRIA 08-0170)	2s	2s	100	100

[a] City of Issaquah CAO 18.10.780

Clay Pit Creek

Clay Pit Creek (WRIA 08-0712) is a moderate to high gradient, first order stream that drains approximately 0.2 square miles of Cougar Mountain (**Montgomery Water Group 2001**). Clay Pit Creek originates on the steep, forested east slope of Cougar Mountain and flows east approximately 0.8 miles to its confluence with Tibbetts Creek (**Figure 2**).

The creek crosses under SR 900 through a 44-foot long concrete box culvert at MP 20.09 before entering the alluvial Tibbetts Valley floor. WDFW has identified the SR 900 culvert crossing as a fish passage barrier that is only passable 30% of the time, due to slope and outfall (**WDFW 2004**).

Because this culvert crossing is identified as a fish passage barrier, this culvert will be replaced with a new longer crossing designed in accordance with Washington Administrative Code 220-110-070 and WDFW fish passage guidelines (**Appendix A, Sheets 1 and 2**) (**WDFW 2003**). The replacement culvert is a 6-foot by 8-foot concrete box culvert that is 47 feet in length. The new culvert will be 3 linear feet longer than the existing one, and 24 ft^2 of Clay Pit Creek will be permanently impacted by this construction. Although a negligible amount of fish habitat will be lost, the replacement of this culvert is considered "self-mitigating" because it will improve fish passage (it will be passable at all times) and make 656 linear feet of upstream habitat available to fish.

The culvert replacement will temporarily impact 192 ft^2 of stream channel and 1,340 ft^2 of buffer

vegetation. Buffer vegetation that will be temporarily impacted is dominated by trees species such as big-leaf maple, black cottonwood, western red cedar, and Douglas fir, with an understory of vine maple, Indian plum, sword fern *(Polystichum munitum)*, and trailing blackberry *(Rubus ursinus)*.

West Fork Tibbetts Creek

West Fork Tibbetts Creek (WRIA 08-0171) is a moderate to high gradient, second order stream that drains approximately 0.9 square miles of Cougar Mountain (Montgomery Water Group 2001). West Fork Tibbetts Creek originates on the steep, forested east slope of Cougar Mountain and flows east approximately 1.7 miles to its confluence with Tibbetts Creek. The creek crosses under SR 900 at MP 20.34 through a 44-foot long concrete box culvert with a 7.4-foot drop at its outlet before entering the alluvial Tibbetts Valley floor. The culvert is impassable to fish during any flow (**WDFW 2004**).

The culvert at West Fork Tibbetts Creek will be replaced with a new longer crossing designed in accordance with Washington Administrative Code 220-110-070 and WDFW fish passage guidelines (**WDFW 2003**). The current design of the replacement culvert is a 15- by 8-foot concrete box culvert that is 104 feet in length (**Appendix A, Sheets 4 and 5**). In addition, bank protection will be required in order to protect the adjacent private property to the north of the stream. Large wood with root wads and rock will be placed into the north bank above and at the ordinary high water mark of the stream at the eastern extent of the culvert wing wall in order to stabilize the deeply cut and eroding bank. Extensive bank excavation may be required to complete this work. The large big-leaf maple will be preserved to the greatest extent possible during this work. The design of the bank protection will result in a net increase of LWD at the site. An additional 63 linear feet of stream will be placed into the culvert due to the widening; permanent stream impacts will total 537 ft^2. Temporary stream impact will total 5,291 ft^2, which is the total area of stream restoration, both upstream and downstream of the new culvert.

The improvements at West Fork Tibbetts Creek will include a new enlarged 100% fish passable culvert with rock dams which will stabilize the grade from 40 feet upstream of SR 900 and downstream to its confluence with Tibbestts Creek (**Appendix A, Sheets 4 and 5**). After installation of the rock dams and the new streambed mix, habitat boulders will be hand placed along the entire creek (250 feet upstream and 300 feet downstream of SR 900). The stream banks will be revegetated according to the landscape planting plan (see **Appendix E, Plot 5**).

In-water work may temporarily displace fish from these areas upstream and downstream of SR 900 during construction. All in-stream habitat will be protected by appropriate BMPs and fish will be excluded and protected from any sedimentation that occurs during project construction. Turbidity that may occur when fish passage improvements are completed will be temporary and limited. This work is also considered "self-mitigating" and beneficial as it will open 2,132 linear feet of upstream habitat to salmonids.

Upstream of SR 900, the riparian canopy is good and its streamside structure is mixed coniferous-deciduous and is dominated by trees species such as big-leaf maple and Douglas fir, with an understory of beaked hazelnut, red elderberry, snowberry, vine maple, sword fern, and herb Robert *(Geranium robertianum)*. In the lower reaches vine maple, beaked hazelnut, and

rose dominate the banks. Although conifers are lacking, the canopy cover downstream of SR 900 is generally good. The streamside vegetation structure in this area is primarily deciduous. Within the first 100 feet east of SR 900, the dominant vegetation includes lawn and planted non-natives such as bamboo, but downstream of this point, beaked hazelnut, vine maple, red alder, salmonberry, and Indian plum become more prevalent. Understory vegetation on the steep banks includes herb Robert, sword fern, and lady fern. A few big-leaf maple, Douglas fir, and western red cedar dominate the canopy closer to the mouth. Buffer impact to West Fork Tibbetts Creek will occur on both sides of SR 900 and will total 11,253 ft^2 (0.26 acre); temporary buffer impact will total 4,187 ft^2 (0.10 acre).

Tibbetts Creek Tributary A

Tributary A is an unnumbered tributary to Tibbetts Creek that is not mapped by any resource agency. It headwaters in Wetland 2 and flows north, parallel to SR 900 in the widening corridor, before being culverted under the Squak Mountain Nursery driveway at MP 20.55 in the widening corridor. After crossing under the driveway, it flows into North Tributary, which then flows to Tibbetts Creek. Fine sediments from the wetland flow into the stream and have aggraded in and filled most of the 12-inch culvert under the Squak Mountain driveway.

The proposed project will not permanently or temporarily move, fill, or otherwise impact Tributary A or its buffer, as roadway widening and associated activities will take place on the west side of SR 900 in this area, opposite from the stream. BMPs will be installed to protect the stream from incidental, unexpected impacts during project construction and staging activities.

North Tributary

North Tributary, an unnumbered tributary to Tibbetts Creek, flows east from its origin on the east slope of Cougar Mountain and crosses under SR 900 immediately north of the Squak Mountain Nursery driveway at MP 20.59. Immediately upstream of SR 900, the channel is highly constricted and a four-foot vertical drop has formed as a result of subsequent downcutting. At this location, the Talus development has installed a v-notch weir to measure channel flow. After crossing under SR 900, it takes a 90-degree turn south and flows parallel to SR 900 to the edge of the Squak Mountain Nursery driveway. It then turns east again and flows through an excavated ditch at the edge of the driveway to its confluence with Tibbetts Creek.

North Tributary crosses under SR 900 through a 12-inch diameter, 58-foot long concrete culvert. The North Tributary crossing will require installation of a drop inlet at the upstream limits of the roadway widening because of a naturally occurring four-foot headcut approximately 15 feet west of SR 900. The drop inlet will tie into the existing culvert. A 52-foot extension of the culvert will be required to accommodate the widening. Direct impacts to North Tributary will total 171 ft^2; temporary impacts will total 1,313 ft^2 (**Appendix A, Sheet 7**). No fish passage is required at this tributary (**Fraser pers. comm. 2004**).

Upstream of SR 900 where widening will take place, the riparian corridor is second-growth mixed coniferous and deciduous forest, which is bordered to the south by a residential home and to the north by the Talus stormwater ponds. The mixed second-growth forested canopy is dominated by Douglas fir, red alder, bigleaf maple, and western red cedar, with an understory of vine maple, snowberry, and Himalayan blackberry. Downstream of SR 900, the riparian corridor

is dominated by transportation structures to the south (the nursery driveway and SR 900) and agriculture (cultivated field) to the north. Reed canarygrass dominates the riparian area for approximately 200 linear feet and fills in the channel in places. Buffer impact occurs both downstream and upstream of SR 900. Permanent buffer impact will total 15,227 ft^2 (0.35 acre) and temporary buffer impact will total 6,446 ft^2 (0.15 acre) from roadway widening and stormwater pond construction.

Tibbetts Creek Tributary B

Tributary B is a second order, unnumbered tributary to Tibbetts Creek. It originates as seeps and sheet flow from wetlands on the east slope of Cougar Mountain. Two smaller tributaries join approximately 500 feet west of SR 900 and flow under a newly constructed walking trail along the east slope of Cougar Mountain. The stream then flows east into Wetland 3, immediately adjacent to the west side of SR 900, sheet flowing into the shrub-dominated wetland (**Appendix A, Sheets 8, 9, and 10**).

Immediately upstream of SR 900, Tributary B has no defined channel; it disperses through a wetland before being culverted under SR 900 where it flows into an excavated channel to Tibbetts Creek. The existing 12-inch concrete culvert under SR 900 will be extended approximately 21 linear feet east and 34 linear feet west of its existing location, with a total extension of 51 linear feet. The 34 feet extension to the west is into wetland and is counted as wetland impact, not stream impact. Permanent impact to the stream will total 163 ft^2; temporary impact to the stream will total 1,289 ft^2, which is the total area of stream enhancement downstream of the extended culvert east of SR 900. WDFW has agreed that the culvert at this location does not need to be fish passable as there is limited available upstream habitat (**Fraser pers. comm. 2004**). The western extension will accommodate roadway widening, while the eastern extension will accommodate the construction of an access road across the stream.

Where Tributary B flows into Wetland 3, the wetland is dominated primarily by shrubs including Pacific willow, Sitka willow, red-osier dogwood, and black twinberry (*Lonicera involucrata*), with a dense understory of creeping buttercup, slough sedge *(Carex obnupta)*, and reed canarygrass.

The riparian zone downstream of SR 900 is severely degraded, which is directly related to adjacent land use. The functional buffer of Tributary B has been limited to a narrow, shrub-dominated corridor because of past grazing by livestock on the adjacent agricultural fields. The downstream reach is completely devoid of conifers. Dominant species along the shrub-dominated corridor are Himalayan blackberry, Evergreen blackberry, beaked hazelnut, snowberry, and red alder. In-stream and riparian habitat of Tributary B will be enhanced as stream mitigation for this project (**Appendix D, Sheets SM1 and SM2**), and is described in more detail in the Proposed Stream Mitigation Description section of this document.

Tibbetts Creek Tributary C

Tributary C is an unnumbered tributary to Tibbetts Creek on the west side of SR 900. It is located between the Emerick familys driveway and Wetland 3 near MP 20.72 in the widening corridor (**Appendix A, Sheet 10**). Tributary C likely originates in a forested wetland west of the Emerick's greenhouse, from which water is collected in an underground well on the Emerick

property and is culverted under property structures towards the gravel driveway. The stream surfaces, but has no defined channel, on the forested slope along the property fence line, between the Emerick's driveway and a yellow barn. From here, it travels subsurface under the yellow barn and emerges at the edge of a gravel driveway, where it runs southeast in a channel down the edge of the driveway and dissipates into Wetland 3. The two-foot wide channel is dominated by forest duff by the yellow barn, and road fill material and small gravels adjacent to the driveway. It was dry during an August 2005 field visit.

Tributary C does not cross SR 900, but flows along the south shoulder of a driveway before flowing into a wetland on the west side of SR 900. It does not cross under SR 900 and is not fish accessible.

The project will relocate Tributary C southwest of its current location in order to provide access to the property with construction of a new driveway. From the well, the existing 71-linear foot culvert that conveys Tributary C will be plugged, and the stream will be daylighted into a new channel. Tributary C will be relocated away from the gravel driveway where it currently drains, and into a newly constructed stream channel connecting to the existing channel that outflows into Wetland 3. This relocation will provide additional 229-linear feet of stream channel habitat and remove 71-linear feet of culverted stream. The new stream channel will be 3.5-feet wide and will provide improved water quality benefits, increased input and export of organic matter, and improved habitat conditions at this location and to downstream reaches. Tributary C will incur 35 ft^2 of temporary impact from grading of the new stream channel to match in with the existing channel at its tie-in location. Temporary impacts associated with construction and relocation of Tributary C includes potential sedimentation/turbidity in the stream. All areas of temporary disturbance will be restored to their original grade and seeded with appropriate native vegetation. Work will occur during no flow conditions.

Tibbetts Creek Tributary D

Tributary D is an unnumbered tributary to Tibbetts Creek on the west side of SR 900 near MP 20.95 in the widening corridor, just south of James Bush Road (**Appendix A, Sheet 11**). Tributary D is a high gradient, intermittent stream that headwaters on the east slope of Cougar Mountain. From here, it flows east, roughly paralleling James Bush Road, before entering a storm drain approximately 150 feet west of SR 900. The water then flows into the SR 900 stormwater conveyance system and discharges to Tibbetts Creek on the south bank, just downstream of the SR 900 Tibbetts Creek Bridge. With the exception of a large riparian buffer in some places, habitat associated with Tributary D is substantially limited.

Up to 79 linear feet of the existing channel will be enclosed in the new stormwater conveyance system to accommodate reconstruction and improvements to this roadway. No fish passage is required at this tributary (**Fraser pers. comm. 2004**). Direct stream impact will total 335 ft^2; temporary stream impact will total 54 ft^2.

Where Tributary D angles away from James Bush Road, most of the riparian corridor is vegetated with early successional trees and shrubs. Young stands of red alder dominate the landscape, often with an understory of Himalayan blackberry, coastal manroot *(Marah oreganus)*, salmonberry, and creeping buttercup. Direct buffer impact will total 3,591 ft^2 (0.08

acre); temporary buffer impact will total 1,300 ft^2 (0.03 acre).

Tibbetts Creek Tributary E

Tributary E is an unnumbered tributary to Tibbetts Creek on the west side of SR 900. It is located between Goode Place NW and James Bush Road at MP 20.95 in the widening corridor (**Appendix A, Sheet 12**). Tributary E is a high gradient, intermittent stream that headwaters on the east slope of Cougar Mountain. From here, it flows east into a steep ravine, roughly paralleling James Bush Road until it angles north and the gradient flattens out. The stream continues to flow east down the southern property line of the Lee residence and then into a ditch due east to the edge of SR 900, where it cascades down a vertical riprap slope and into a catch basin. The water then flows into the SR 900 stormwater conveyance system and discharges to Tibbetts Creek on the south bank, just downstream of the SR 900 Tibbetts Creek Bridge. With the exception of moderate complexity in its riparian corridor upstream of SR 900, habitat associated with Tributary E is substantially limited.

Approximately 46 linear feet of Tributary E will be enclosed in the new stormwater conveyance system when the roadway is widened over the existing channel. No fish passage is required at this tributary (**Fraser pers. comm. 2004**). Direct stream impact will total 129 ft^2; temporary stream impact will total 43 ft^2.

Between SR 900 and the southwest corner of the Lee property, the tributary north bank is the residential lawn, and the south bank is dominated by Himalayan blackberry, on the other side of which is a residential construction site. Direct buffer impact to Tributary E will total 3,966 ft^2 (0.09 acre); temporary buffer impact will total 1,279 ft^2 (0.02 acre).

Tibbetts Creek

Tibbetts Creek (WRIA 08-0169) crosses under SR 900 at MP 21.04, near the northern terminus of the widening corridor (**Appendix A, Sheet 14**). Tibbetts Creek is a relatively short stream (4.3 miles) that drains approximately 5.4 square miles (**Kerwin 2001**). Its basin encompasses the steep upper reaches of Squak and Cougar Mountains and drops rapidly into Tibbetts Valley between the two mountains. Within the study area, Tibbetts Creek is primarily a low gradient stream that historically meandered across the confines of Tibbetts Valley floor. Downstream of its crossing at SR 900, Tibbetts Creek enters the wide historic floodplain it shares with Issaquah Creek. Tibbetts Creek flows northwest and eventually drains into the south end of Lake Sammamish, west of the mouth of Issaquah Creek. Tibbetts Creek contributes approximately 6% of the volume of Lake Sammamish (**Kerwin 2001**).

The in-stream and riparian habitat of Tibbetts Creek has been heavily degraded by historic land use; and much of the existing habitat is monotypic and overrun with non-native species. Thirty-two pieces of LWD were documented in the examined reach, nearly all of which appear to have been installed as part of a recent restoration project.

The existing Tibbetts Creek Bridge will be widened on both sides of the existing structure. The existing pre-stressed concrete beam bridge has a 20-foot span, is 58 feet long, and is skewed at a 23^o angle. The widened bridge will be 105 feet long and 20 feet wide (**Appendix A, Sheet 14**). All of the footings and wing walls will be located outside of the OHWM of the stream, with the

exception of a small portion of the northeast wing wall and footing. The location and angle of the wing wall was designed to minimize the angle between the flow of the stream and the wall. This wing wall and footing will extend approximately 10-feet into the stream channel for a total of 39 ft^2 of permanent stream impact. Temporary impacts to the stream may occur for construction access to build the bridge, for a total of 1,129 ft^2 (72 linear feet).

The stream crossings in the project area will be at or near low flow stage during project construction. Regardless of stream flow conditions, the Contractor will be required to develop a dewatering and stream diversion plan, which will be reviewed and approved by the WSDOT project engineer. The Contractor will isolate the in-water work area and a qualified biologist will exclude fish using the WSDOT Fish Removal Protocols and Standards (**WSDOT 2005a**). A containment system will be installed to prevent demolition debris from entering the stream and to prevent turbidity within the isolated in-water work area. Stream flows will be temporarily diverted around the in-water work area and suitable precautions will be used to prevent fish stranding. To minimize and/or avoid impacts to Tibbetts Creek riparian and in-stream habitat, the Contractor will operate all heavy machinery from the existing roadway prism.

The channel will be shaped under the bridge to match upstream and downstream transitions. Any use of riprap will be minimized and LWD and toe logs will be installed as needed. A WDFWapproved streambed gravel mix will be added under the newly constructed bridge to match the bed load content upstream. Construction access, BMPs, installation of the waterline, and diversion of the stream will result in 72 linear feet of temporary impacts in the channel.

The stream banks west of SR 900 have been armored with riprap and Himalayan blackberry dominates the corridor for approximately 70 feet. Upstream of SR 900, the red alder and black cottonwood-dominated canopy has recently been underplanted on both banks with Sitka willow, Pacific willow, Sitka spruce, western red cedar, and western hemlock. Aside from the recently planted saplings, dominant understory species in this reach include beaked hazelnut, red-osier dogwood, Sitka willow, and Pacific willow, with an herbaceous layer that includes herb Robert, giant horsetail, and sparse reed canarygrass. Total bridge widening of 47 linear feet will fill or otherwise clear approximately 9,957 ft^2 (0.23 acre) of riparian buffer and temporarily impact 3,939 ft^2 (0.09 acre) of riparian buffer.

Tibbetts Creek Tributary 0170

Tributary 0170 (WRIA 08-0170) is culverted under SR 900 in the ramp realignment area, near MP 21.64. Tributary 0170 is a low-gradient stream that originates in the floodplain south of I-90 near the Gilman Boulevard-Newport Way intersection. It flows northwest through culverts and straightened ditches and under urban infrastructure to its confluence with Tibbetts Creek just inside the west entrance to Lake Sammamish State Park. Tributary 0170 was ditched as part of the agricultural drainage district in the early to mid-twentieth century and commonly has a deep, trapezoidal channel with steep banks and limited vegetative cover.

Stream conditions are highly degraded. Within highway right of way, Tributary 0170 is regularly dredged of excess sediments and its vegetation maintained to improve sight distance. Salmonids have been observed in this tributary and it has a surface water connection to Tibbetts Creek (**King County 2001a, Entranco 1999**).

No direct impacts are proposed for Tributary 0170 or its buffer.

Summary of Stream and Stream Buffer Impacts

Approximately 139 linear feet of stream channel habitat will be permanently culverted or otherwise covered by additional structure, approximately 71 linear feet of ephemeral stream will be day lighted into 229 linear feet of open channel habitat, and approximately 125 linear feet of ephemeral stream channel will be enclosed in the new stormwater conveyance system. Approximately 1.01 acres of stream buffer will be permanently removed in order to accommodate highway widening.

Direct impacts to stream habitat include:

- Cutting and filling over riparian vegetation for roadway construction;
- Lengthening tributary culverts;
- Repairing fish passage barriers at Clay Pit Creek and West Fork Tibbetts Creek;
- Replacing the bridge over Tibbetts Creek with a wider structure; and
- Constructing the stormwater pond.

The majority of stream and buffer impacts will be on the west side of SR 900; however, some impacts will also be on the east side. The approximate impacts to each stream, their buffer, and temporary impacts to both stream and buffer within the project area are summarized in **Table 5**. A comparison of existing and proposed culverts/bridges is included in **Table 6**.

Long-term impacts to Tibbetts Creek and its tributaries include a loss of aquatic invertebrate and amphibian habitat, and a loss of salmonid rearing habitat as a result of the culvert extensions. Removing the two fish passage barriers at Clay Pit and West Fork Tibbetts Creeks, however, will have a substantial net benefit to salmonid populations, as it will open 2,789 linear feet of upstream habitat. Widening the highway would increase impervious surface in the basin and could potentially increase levels of metals and high flows, and result in impacts to low flows in the basin. There will be a loss in potential LWD recruitment from riparian areas that will be converted to impervious surface. Changes in bank stability and canopy cover can also reduce available habitat, increase predation, and increase water temperature, all of which could impact future salmonid populations.

Stream buffer impacts include loss of herbaceous and scrub-shrub streambank vegetation, consisting primarily of marginally functioning roadside vegetation, such as reed canarygrass, Himalayan blackberry, and occasional willow species. Small areas of forested riparian buffer will also be removed. The stream buffer's primary functions are direct organic inputs into the stream environment, shading for fish, and streambank stabilization from established root systems. The loss of the tree and shrub vegetation will result in the long-term reduction of screening, buffer functions, shading, organic debris production and export, and large woody debris recruitment. Herbaceous vegetation also provides these functions, but to a lesser extent.

Temporary impacts to streams and their buffers include temporary clearing of streamside vegetation and short-term increases in turbidity. In-stream work will be completed at low flow, within the designated fish window for the basin. Many of the smaller tributaries either do not

support fish populations upstream of SR 900 where the majority of the widening will take place, or go dry in the summer, when in-water work would occur.

Table 5. SR 900 widening project approximate stream and buffer impacts.

Stream	Direct Stream Impacts		Riparian Buffer	
	Permanent Impact (sf)	Temporary Impact (sf)	Permanent Impact (sf)	Temporary Impact (sf)
Clay Pit Creek (WRIA 08-172)	24	192*	0	1,340
West Fork Tibbetts Ck. (WRIA 08-0171)	537	5,291*	11,253	4,187
North Tributary	171	1,313	15,227	6,446
Tributary B	163	1,289*	0	0
Tributary C	0	35	0	0
Tributary D	335	54	3,591	1,300
Tributary E	129	43	3,966	1,279
Tibbetts Creek (WRIA 08-0169)	39	1,129	9,957	3,939
TOTAL AREA (sf)	**1,398**	**9,346**	**43,994**	**18,491**
TOTAL AREA (ac)	**0.03**	**0.21**	**1.01**	**0.42**

*Temporary impacts are a result of stream restoration and/or enhancement work activities.

Table 6. SR 900 stream crossings: existing and proposed culverts.

Stream[a]	Existing Culvert/Bridge[b]	Proposed Culvert/Bridge[b]	Length Increase (linear feet)
Clay Pit Creek (WRIA 08-0172)	44' long U/S: 2.5' x 4.5' concrete box D/S: 3' x 4.5' concrete box	47' long 6' x 8' concrete box	3
West Fork Tibbetts Creek (WRIA 08-0171)	41' long U/S: 3.5' x 5' concrete box D/S: 3.5' x 6' concrete box	104' long 15' x 7' concrete box	63
North Tributary	58.5' long 1.5' diameter concrete pipe	106.5' long 1.5' diameter concrete culvert extension w/ drop structure	52
Tributary B	57' long 1' diameter concrete pipe	Total Length = 108' concrete culvert extension extend 34 LF upstream extend 17 LF downstream	21[c]
PERENNIAL STREAM SUBTOTAL			**139**
Tributary D	Trib enters stormwater system that outfalls to Tibbetts Creek	12 in CMP culvert extension of 79 LF upstream	79
Tributary E	Trib enters stormwater system that outfalls to Tibbetts Creek	12 in CMP culvert extension of 46 LF upstream	46
EPHEMERAL STREAM SUBTOTAL			**125**
Tibbetts Creek (WRIA 08-0169)	58' long 20' wide precast tee-beam bridge	105' long 20' wide precast tee-beam bridge	47
TOTAL			**311**

[a] Tributaries A, C, D, and E do not have culvert crossings under SR 900; Portions of Tributaries D and E will be enclosed in the new stormwater conveyance system.
[b] U/S = upstream; D/S = downstream; H = height; W = width; L = length; LF = linear feet
[c] The 21-foot downstream extension is a direct stream impact; the 34-foot upstream extension is a direct wetland impact.

MITIGATION APPROACH

This section describes the mitigation approach that was used to determine the type of wetland and stream mitigation needed. The mitigation approach is based on a hierarchy of avoiding and minimizing impacts through careful design, and compensating for unavoidable adverse impacts, also known as mitigation sequencing (**Ecology 1994**). The mitigation process began with design efforts to avoid and minimize project impacts to wetlands and streams. Design refinements were considered and incorporated where feasible to reduce the potential loss of existing wetland and stream habitat and function.

Impact Avoidance and Minimization

WSDOT has avoided and minimized impacts to wetlands, streams, and buffers to the greatest extent possible. Since wetlands and streams occur on both sides of the highway, and to satisfy safety and roadway design guidelines, total impact avoidance was not possible. Impacts were minimized primarily through site-specific design techniques. Compensatory mitigation will replace wetland and stream area and functions lost as a result of unavoidable impacts. Avoidance and minimization employed as part of the roadway improvement design included the following:

Wetland 1

- The roadway side slope was reduced from 4:1 to 2:1. This adjustment reduced wetland impacts by 0.025 acre.

Wetland 2

- Detention Pond #1 (Kelly Property) was eliminated from the design by compensating areas of new impervious surface with existing untreated impervious surface. Wetland impacts were reduced by 0.85 acre.
- The side slope of Detention Pond #2 was reduced from 4:1 to 3:1. This adjustment reduced wetland impacts by 0.047 acre.
- The access/maintenance road side slope was reduced from 4:1 to 2:1. This adjustment reduced wetland impacts by 0.029 acre.

Wetland 3

- A retaining wall, approximately six to nine feet in height, will be constructed between MP 20.67 and MP 20.73. This retaining will reduce wetland impacts by 0.20 acre.

Clay Pit Creek, West Fork Tibbetts Creek, Tributary B

- The roadway side slopes were reduced from 4:1 to 2:1 at the stream crossings. This adjustment reduced direct stream impacts by 34 linear feet.
- Impacts to the stream were reduced by an additional 13 linear feet by eliminating the sidewalk at this location.

Tibbetts Creek

- Bridging the stream instead of enclosing it in a culvert, reduced permanent stream channel habitat impacts by 47 linear feet (638 ft^2).
- To minimize and/or avoid impacts to Tibbetts Creek riparian and in-stream habitat, the Contractor will operate all heavy machinery from the existing roadway prism.

- The roadway side slopes were reduced from 4:1 to 2:1. This adjustment reduced direct stream impacts by 8 linear feet.

Tributary E, North Tributary Tibbetts Creek

- A retaining wall was designed for these streams instead of the standard design of 4:1 slopes. This adjustment reduced stream impacts by 84 linear feet.

The project will install a pervious sidewalk the entire length of the nearly mile-long project corridor. The pervious sidewalk will reduce the total treated impervious surface substatially, which allowed a reduction in the total area required for stormwater treatment ponds, eliminating impacts by nearly an acre of wetland along the east side of SR 900.

Compensatory Mitigation

Because not all wetland and stream impacts could be avoided, compensatory mitigation is proposed. The factors considered in evaluating compensatory mitigation options and selecting the proposed wetland mitigation sites are listed below.

- Mitigation sites located within or close to the impacted basins.
- Mitigation sites with a high probability of success have been selected, such as wetland creation sites adjacent to an existing wetland or stream with a reliable source of hydrology.
- Mitigation that provides riparian restoration for permanent stream buffer impacts.
- Wetland functions lost can be mitigated by creation, restoration, and enhancement of wetlands. There will be no net loss of wetland area or function per the Governor's Executive Order 89-10.
- Mitigation sites are of appropriate size and hydrologic condition in order to satisfy local, state, and federal requirements for wetland replacement and riparian impacts.
- Mitigation is located on fewer large sites rather than numerous small sites per agency request. As such, it was not possible to locate mitigation within the same sub-basin as the impact.

Regulatory Requirements for Wetlands

The project will impact 0.75 acre of palustrine wetland and 0.73 acres of wetland buffer. As identified in the Governor's Executive Order 89-10 (Protection of Wetlands: "No Net Loss") and WSDOT Directive 31-12 (Protection of Wetlands Action Plan), WSDOT is required to create and restore area and function of wetlands impacted at a minimum 1:1 mitigation ratio. The City of Issaquah Critical Areas Regulations (**2006**) was also adopted to protect wetlands and mitigate for filling wetlands. Additional mitigation is required to satisfy WSDOE (Ecology) wetland mitigation guidelines as outlined in the WSDOT and Ecology 1993 Implementing Agreement. All buffer impacts will be mitigated at a 1:1 ratio.

Local Jurisdiction Compensatory Mitigation Requirements

According to the Issaquah Critical Areas Regulations (CAR), the minimum amount of wetland mitigation required for this project is 0.75 acre, based solely on using wetland creation to compensate for the quality of the wetlands lost (**Table 7**). The CAR requires a mitigation ratio of 2:1 for impacts to Category II wetlands and a 1:1 ratio for impacts to a Category III wetland.

Department of Ecology Compensatory Mitigation Recommendations

The total area of wetland mitigation proposed is based on the guidelines established in the WSDOT and Ecology Implementing Agreement (**1993**). Wetland impacts associated with this project occur to Ecology Category II and III wetlands. Ecology recommends replacement of Category II wetlands at a 2:1 ratio and a Category III at a 1-1.5:1 ratio. Since the mitigation ratios for impacts to Category III wetlands vary, determination of mitigation ratios is dependent on an assumption of sufficient hydrology. If the mitigation site contains existing wetland area with visible hydrology (such as ponded water) or if a year of groundwater monitoring data has been collected, then lower mitigation ratios can be employed. Groundwater monitoring wells were installed on the site in December 2005. These wells will be monitored monthly until the site is constructed. Since sufficient groundwater data in the growing season is not yet available, the higher mitigation ratios were used to calculate wetland mitigation areas. Based on these ratios, the recommended minimum mitigation area for this project is 1.14 acres for direct wetland impacts (**Table 7**).

Table 7. Mitigation calculations for permanent wetland impacts.

Wetland					Issaquah[b]			WSDOE[c]		
Wetland Number	Classification		Impact Area		Mit. Ratio	Mit. Area		Mit. Ratio	Mit. Area	
	USFWS[a]	Issaquah/ WSDOE	Sq. Ft.	Acre		Sq. Ft.	Acre		Sq. Ft.	Acre
1	PSS/PEM	II	1,447	0.03	2:1	2,894	0.07	2:1	2,894	0.07
2	PEM	III	21,275	0.49	1:1	21,275	0.49	1.5:1	31,912.5	0.73
3	PSS/PEM	III	6,096	0.14	1:1	6,096	0.14	1.5:1	9,144	0.21
6	PSS/PEM	III	758	0.02	1:1	758	0.02	1.5:1	1,137	0.03
7	PEM	IV	2,756	0.06	1:1	2,756	0.06	1.5:1	4,134	0.09
8	PEM	III	202	<0.01	1:1	202	<0.01	1.5:1	303	0.01
TOTALS			**32,534**	**0.75**		**33,981**	**0.78**		**49,524.5**	**1.14**

[a] Cowardin et al.1979
[b] City of Issaquah CAO 18.10.730
[c] Ecology 2004

Regulatory Requirements for Streams

The project will culvert 139 linear feet of stream and will impact 1.01 acres of stream buffer. As previously mentioned, all buffer impacts will be mitigated at a 1:1 ratio.

The June 2002 Memorandum of Understanding between WSDOT and WDFW ensures no net loss of habitat or fish populations as a result of transportation projects and maintenance work as outlined in RCW 77.55 and WAC 220-110-020 (22) (**WDFW, WSDOT 2002**). These elements, in descending order of priority, are:

1. Avoiding the impact altogether by not taking a certain action or parts of an action;
2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
5. Compensating for the impact by replacing or providing substitute resources or

environments; or

6. Monitoring the impact and taking appropriate corrective measures to achieve the identified goal.

Mitigation for stream and buffer alteration is also required for work conducted in the City of Issaquah as outlined in Section 18.10.795 of Issaquah's municipal code. The City's code states that there will be "no net loss of stream functions." It also requires the following of minimum performance standards, as well as maintenance and monitoring of the mitigation site.

Goals

The project will mitigate for impacts to wetlands, streams, and buffers by:

- Creating 1.74 acres and enhancing 0.11 acre of primarily shrub-scrub wetland at the Lake Sammamish State Park (LSSP) site to mitigate for the 0.75 acre of impacts to primarily palustrine emergent wetlands.
- Enhancing 233 linear feet of Tributary B and 516 linear feet of Tributary 0178a to mitigate for the 139 linear feet of perennial stream and 125 linear feet of ephemeral stream that will be culverted or enclosed in the new stormwater conveyance system as a result of the widening project.
- Enhancing 2.23 acres of buffer around the LSSP site and 0.58 acre at the Tributary B site to mitigate for project impacts to 1.71 acres of wetland and stream buffers.

Approach

The proposed mitigation sites have been designed in a manner that replaces area and functions that are lost as a result of proposed wetland, stream, and buffer impacts. The wetland mitigation approach for the SR 900 project involves creating 1.74 acres and enhancing 0.11 acre of Category II wetland at the LSSP site. Enhancement typically receives one-half the acreage credit of creation. Therefore, mitigation credits for this project totals 1.80 acres (**Table 8**).

The mitigation site is located within King County jurisdiction and per King County Critical Area Ordinance; a 75 foot wide buffer will be placed around the wetland creation site. WSDOT will enhance 1.98 acres in the north and west portions of this wetland buffer. This buffer will not be enhanced on the east side in order to maintain the open area and walking trail that currently exists in the area. Instead, WSDOT proposes to enhance 0.25 acre of stream buffer in the LSSP. WSDOT will maintain and monitor the LSSP enhanced wetland and stream buffers (2.23 acres) as part of our wetland monitoring requirements. Table 9 summarizes the project impacts to wetlands, streams, and their buffers, the mitigation required for these impacts, and WSDOT's proposed compensatory mitigation for the impacts.

To mitigate for the combined 139 linear feet of stream that will be placed in a culvert as a result of the widening project, WSDOT proposes to enhance approximately 233 linear feet of Tributary B. Approximately 0.58 acre of riparian buffer will be enhanced at Tributary B. Permanent stream buffer impacts will be mitigated at both the Lake Sammamish State Park site and the stream mitigation site at Tributary B (**Table 9**). The Tributary B mitigation area will be maintained and monitored for five years per the City of Issaquah code and will have separate performance measures from the LSSP site.

Table 8. Mitigation credit earned at the Lake Sammamish State Park mitigation site per the Ecology Implementing Agreement (1993).

Mitigation Method	Proposed Mitigation Area (ac)	Replacement Ratio	Earned Credit (ac)
Creation	1.74	1:1	1.74
Enhancement	0.11	0.5:1	0.06
Totals	**1.85**	**-**	**1.80**

Table 9. Wetland, stream, and buffer impacts and compensatory mitigation required and proposed.

	Acres
Total Wetland Impact	**0.75**
Wetland Mitigation Required [a]	1.14
Wetland Mitigation Credit Earned [b]	**1.80**
Wetland Buffer Impact	0.70
Stream Buffer Impact	1.01
Total Buffer Impact	**1.71**
Buffer Mitigation Required	1.71
Wetland Buffer Enhancement LSSP	1.98
Stream Buffer Enhancement LSSP	0.25
Wetland/Stream Buffer Enhancement Tributary B	0.58
Total Buffer Enhancement Provided	**2.81**

[a] See Table 7.
[b] See Table 8.

Temporary Impact Restoration

Temporary impacts to wetlands, streams, and buffers will be restored on site following completion of construction according to revegetation plans (**Appendix E**).

PROPOSED MITIGATION SITES

Wetland Mitigation Site Description

The proposed wetland mitigation will occur within Lake Sammamish State Park (**Figure 3**). The park encompasses 512 acres and includes 6,858 feet of waterfront on Lake Sammamish (**Washington State Parks 2006**). The park is managed for active and passive recreation with facilities including swimming beaches, a boat launch, picnic shelters, soccer and baseball fields, pedestrian trails, and the Hans Jensen Youth Group Camp. The majority of the developed areas are located in the west and southwest portions of the park. The Hans Jensen Retreat is located in the northeast corner of the park, east of East Lake Sammamish Parkway S.E. The remaining areas are undeveloped and include wetlands, meadows, lakeshore areas, and Issaquah, Tibbetts, and Laughing Jacobs Creeks and riparian corridors.

The portion of the park selected for mitigation is located west of Issaquah Creek, northeast of the soccer fields, and southeast of the park's eastern parking lot. The mitigation is separated into

two locations; the wetland mitigation occurs on either side of Tributary 0178a that drains to Issaquah Creek, and the stream buffer enhancement area is located along Issaquah Creek (**Figure 4**). The wetland creation area ties in to two existing wetlands (LSSP Wetland 1 and Wetland 2); Wetland 2 is a small reed canarygrass dominated depressional wetland that spans both sides of Tributary 0178a, and Wetland 1 is a larger depressional wetland to the south that contains emergent, shrub, and forest wetland communities and outflows to Issaquah Creek through Tributaries 0178a and 0178b (see **Appendix B** for more information).

Figure 3. WSDOT wetland mitigation site at Lake Sammamish State Park.

Ecological Assessment of Existing Conditions

Existing Vegetation

The mitigation site is located within an area of open pasture with tree and shrub species located to the west. The site is bisected by Tributary 0178a, a drainage channel that carries stormwater discharge from the Pickering Place development, just south of Lake Sammamish State Park. Existing vegetation on the mitigation site varies by elevation. The area within the current channel including existing wetlands is dominated by reed canarygrass. Areas above and on either side of the channel are dominated by reed canarygrass with pockets of Himalayan blackberry. The upland areas between the tributary corridor and Issaquah Creek are dominated by redtop and field horsetail, with common velvetgrass, common timothy, ryegrass *(Lolium sp.*), orchardgrass, and tall buttercup *(Ranunculus acris).*

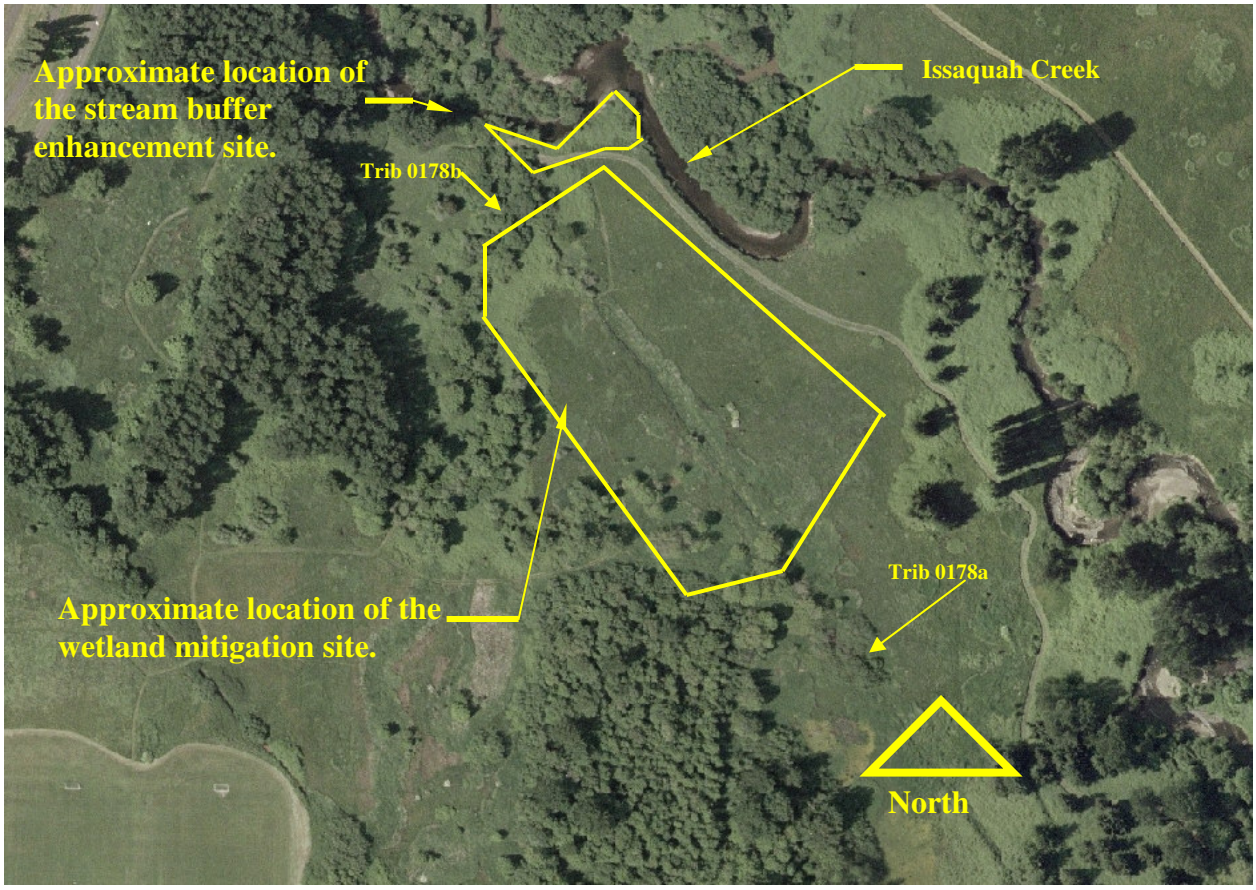

Figure 4. WSDOT mitigation site approximate location.

Existing Water Regime

Sources of water on the mitigation site include a high ground water table of existing wetlands, surface flows within Tributary 0178a and Tributary 0178b, and precipitation. Seventeen groundwater monitoring wells were installed in December 2005 and January 2006. Monitoring well data indicates that groundwater levels fluctuate approximately four feet annually within the wetland creation area (See **Appendix C, Grading Plan**).

Existing Soils

Mapped soils on the mitigation site consist of Puget silty clay loam and Sammamish silt loam (**USDA 1973; Figure 5**). Puget silty clay loam is typically found in low flat bottoms, scattered low basins, and depressions throughout stream bottoms. This soil is poorly drained, and in winter and spring it is typically inundated and can remain permanently wet or waterlogged unless drained. Sammamish silt loam developed under restricted drainages on elevated positions, particularly higher undulations or swells and natural levees along streams. This soil is somewhat poorly drained. Both soil types are included on the state and county hydric soils list.

Soils data collected in the existing smaller wetland located within the footprint of the wetland mitigation site, reveals a very dark grayish brown mucky silt loam matrix with strong brown redoximorphic features to a ten-inch depth. Below ten inches, the matrix is a gleyed silt loam

with organics (**Appendix B**). Data collected from soil pits in the adjacent upland areas indicate a grayish brown silt loam matrix with common medium brown redoximorphic features to a ten-inch depth. Below ten inches, the matrix changes to red-brown sandy silt loam with distinct brown redoximorphic features.

Streams

Tributary 0178a (WRIA 08-0178a) is an excavated, trapezoidal ditch that drains into Issaquah Creek near river mile (RM) 0.5. Tributary 0178b is a low gradient stream that drains a portion of Wetland 1 northeast, into Tributary 0178a just south of the pedestrian bridge. This tributary is located west and outside of the mitigation area, but 139 ft^2 will be temporarily impacted by the access road to construct the site. A temporary culvert will be installed in the stream channel to allow hydrologic connectivity while the access road is in place.

Tributary 0178a bisects the proposed wetland mitigation site for the project in Lake Sammamish State Park. Flows appear to originate at or near the stormwater ponds associated with the Pickering Place development just south of LSSP. From there, the stream flows northwest through a deep, excavated channel under SE 56th Street. The stream frequently floods during storm events and appears to receive most of its flow from stormwater. Channel substrate is dominated by fines and sands. It is expected that all juvenile salmon species existing in Issaquah Creek would seasonally use Tributary 0178a for refuge and rearing (**MAP Team Letter 2006**).

The proposed wetland mitigation site is immediately adjacent to and includes riparian buffer enhancement along Issaquah Creek (WRIA 08-0178). The mainstem of Issaquah Creek is approximately 17 miles long and originates on the steep slopes of Tiger Mountain. From its origins, Issaquah Creek flows southwest to RM 12.5, where it turns north and flows through Cedar Grove, south of Squak Mountain. It enters the narrow valley formed by Squak Mountain and Tiger Mountain at RM 7.0 and continues flowing north to RM 2.0 where it enters the broad alluvial floodplain at the south end of Lake Sammamish and crosses under I-90, eventually flowing into Lake Sammamish. Issaquah Creek is known to be used by spawning, rearing, and migrating Chinook, coho, chum, and sockeye salmon, and steelhead and sea-run cutthroat trout. Bull trout may use Issaquah Creek but no recent observations have been made (**MAP Team Letter 2006**).

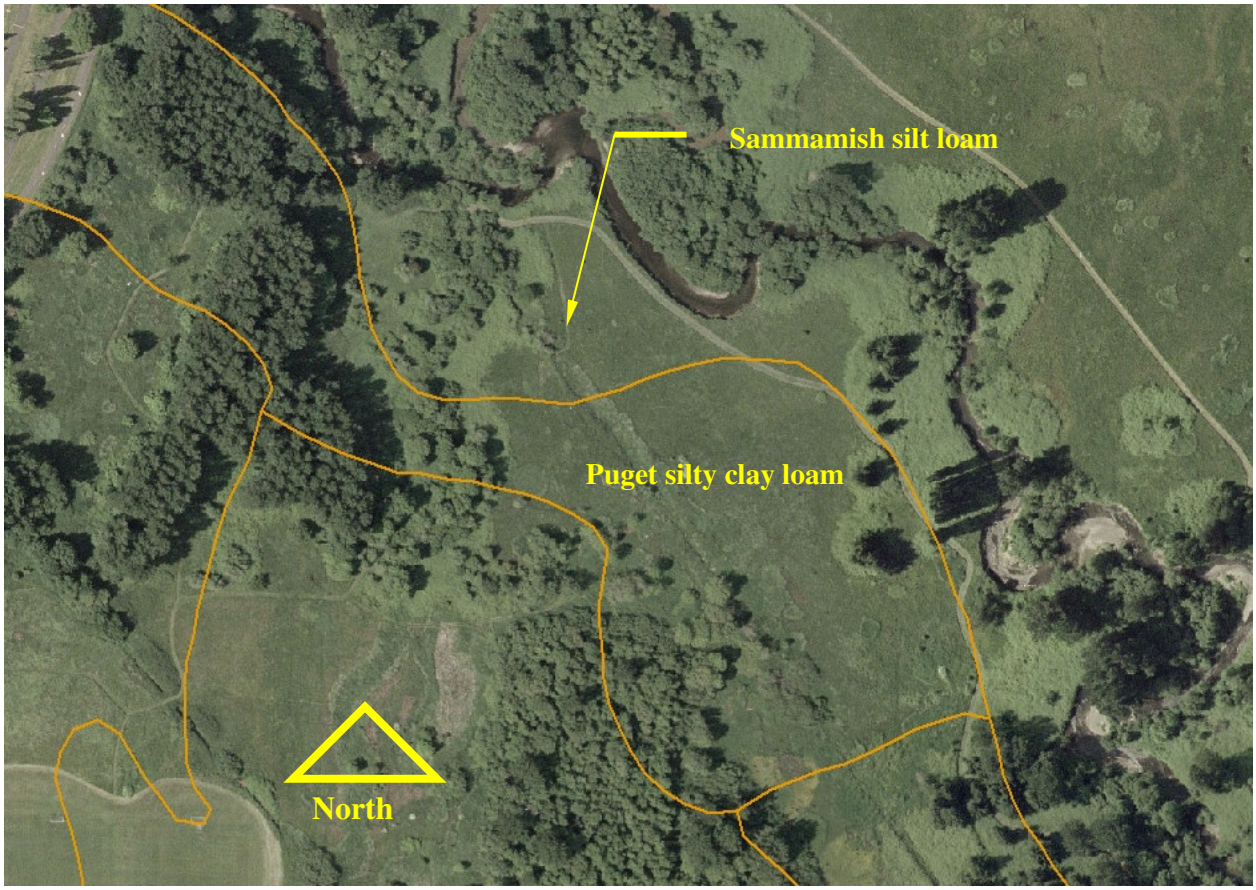

Figure 5. Mapped soils at the mitigation site.

Rationale for Choice of Mitigation Site

The LSSP mitigation site was chosen for the following reasons:

- The mitigation site, when developed, will provide wetland functions equal to or greater than those impacted by the project.
- The property is located near Issaquah Creek, Tributary 0178a, existing wetlands, and forested uplands permitting increased functions within the entire sensitive area complex.
- The site is owned by Washington State Parks, which will limit any potential of future development in or near the mitigation area.
- The mitigation site has been designated as an area requiring enhancement per the Park's master plan.
- The on-site soils within the mitigation area are mucks, silt loams, or sandy loams and are noted as hydric on local, state, and federal hydric soils lists. These soils will support herbaceous and scrub-shrub wetland plantings.
- The mitigation site consists of an undeveloped area offering relatively easy access from existing trails that can be used for both construction and monitoring.
- The proposed mitigation will permit educational opportunities with the possible installation of interpretative signage along the informal pedestrian recreational paths (this is still being negotiated with the Park).

Proposed Mitigation Design

The design for this site involves 1.74 acres of wetland creation, 0.11 acre of wetland enhancement, 1.98 acres of wetland buffer enhancement, and 0.25 acre of riparian buffer enhancement within existing state park property. The created wetlands will consist primarily of scrub-shrub vegetation communities. In addition, 516 linear feet of Tributary 0178a will be enhanced as part of the mitigation project. The proposed mitigation design is described below.

Wetland Creation

Grading Design

The intent of the wetland mitigation is to create scrub-shrub wetland from existing herbaceous upland area adjacent to Tributary 0178a. The mitigation design concept is to lower elevations on each side of the tributary permitting the newly created wetland to access the high groundwater table and provide storage for high winter tributary flow elevations. Slopes in this area will be relatively flat from the top of the tributary low-flow channel to the buffer area. The tributary channel will be graded to remove and control reed canarygrass which currently chokes the channel, and to even out the gradient to an approximate two percent slope to prevent fish stranding. LWD will be installed along the stream channel and banks to provide channel roughness and complexity, and habitat for aquatic species. The LWD will be a minimum stem size of 12-inch diameter and 15-feet long, from a native conifer species with bark tightly intact on at least 75% of each log. Placement of the LWD will be determined on-site by a biologist and/or hydrologist. The channel width will remain approximately 20-30 feet wide, the channel will be seeded with a native wetland seed mix, and the banks will planted densely with native willow species.

Data collected from the piezometers in years 2006 and 2007 within the mitigation footprint in the early growing season indicate that groundwater will be present between elevations 36.1 feet and 37.4 feet (Year 2006) and between elevations 35.9 feet and 38.1 feet (Year 2007) in the northern portion of the wetland creation area (P2 and P3), and between 37.6 feet and 38.6 feet (Year 2006) and between elevations 37.7 feet and 40.3 feet (Year 2007) in the southern wetland creation area (P9 and P10; See **Appendix C, Grading Plan**). Higher groundwater elevations were found in the southern areas corresponding to existing lower topography. Based on this data, the new wetland area will be excavated to finish grade elevations between 36.00 feet and 40.00 feet. Groundwater data collection will continue until initiation of construction, anticipated to be spring 2008.

Upon establishment of finish grade elevations, the existing soil will be fully amended and mulched with an organic soil material. Once grading has been completed, the stream area will be seeded with a native wetland seed mix and groundwater monitoring wells will be re-set. After final grading, five brush piles will be constructed and installed in the upland buffer and transitional areas of the mitigation site. The piles should be approximately 20-feet wide by 10-feet high and intend to mimic areas of fallen trees that consume understory vegetation to attract small mammals, amphibians, reptiles, predatory species, and passerine-sized birds.

Vegetation

Four vegetation communities are proposed for the mitigation site; one stream enhancement, two scrub-shrub wetland, and two buffer enhancement communities. A scrub-shrub wetland is proposed at this site instead of a forested wetland community at the request of the Sammamish State Park in order to preserve open views into the site from the trail system.

The stream enhancement community is located on the banks of Tributary 0178a and within a portion of the ordinary high water mark (OHWM) of the tributary. This area will be densely planted (live staked) with Pacific and Sitka willow on 3-foot centers. The intent of this community is to provide vegetation to shade and out-compete the existing reed canarygrass community and provide bank stabilization, water quality benefits, and wildlife habitat functions.

On the terrace adjacent to the channel and up to elevations 38.0 and 40.0 feet, a scrub-shrub wetland community will be established. The community will consist of Sitka willow, red-osier dogwood, salmonberry, clustered wild rose, western crabapple, black twinberry, and Pacific ninebark in the lower community, and black hawthorn, Nootka rose, Scouler's willow, twinberry, and salmonberry in the upper community (**Appendix C, Planting Plan**). This area will receive channel flows during peak storm events, and will also experience summer draw-down as groundwater elevations drop. Two zones were created to account for the slightly drier community that will be created on the wetland edge.

Buffer Enhancement

A 50-foot wide riparian buffer along Issaquah Creek (totaling 0.25 acre) will be enhanced to provide screening and buffering functions, a source of wood recruitment, bank stabilization, and to enhance wildlife functions. The buffer community will contain tree and shrub species including big-leaf maple, Douglas fir, western red cedar, red elderberry, serviceberry, snowberry, and thimbleberry (**Appendix C, Planting Plan**). The existing blackberry and reed canarygrass will be removed to the ground and then sprayed. Compost and mulch will be added to the soil. These amendments will not be tilled in because of bank stability issues along Issaquah Creek. Soil disturbance will be limited to plant installation.

A 75-foot wide buffer will be placed around the wetland creation area. The east side of this buffer area will not be planted in order to meet the state park's request to preserve its pastoral quality. The north and west sides of the wetland buffer will have soil amendments tilled in and mulched prior to planting. This buffer will be planted using the same planting mix as described in the stream buffer enhancement above and an additional mix (Interplanting Mix) at the northern buffer of the mitigation area, which includes Western red cedar, snowberry, and thimbleberry.

Temporary Access Impact Restoration

WSDOT will need to temporarily widen two existing grass paths located in the LSSP in order to create a temporary access road to each side of the wetland mitigation site to get large construction vehicles to the site. Access to construct the mitigation site at the LSSP will result in temporary impacts to the wetland and buffer of Wetland 1, Tributary 0178b, and the buffer of Issaquah Creek (see **Appendix A, Sheets M1 and M2**). These two access routes will temporarily impact 0.12 acre of Wetland 1 and 0.40 acre of Wetland 1 buffer, temporarily impact 139 square feet (13 linear feet) of Tributary 0178b, and temporarily impact 0.06 acre of Issaquah Creek buffer. The vegetation impacted is primarily pasture grasses and non-native invasive

species, with some minor trimming of shrubs and tree branches. Access roads will be located on the existing path in most areas of the LSSP. In two locations, however, the access road will cross through a patch of vegetation that primarily consists of Himalayan blackberry. The paths through the vegetation were chosen so as to minimize impacts to native shrubs and trees. These areas will have the same revegetation plans as other temporary impact areas in the mitigation project area, and the stream channel of Tributary 0178b will be restored to existing size and grade.

Stream Mitigation Site Description

The culvert replacements on Clay Pit Creek and West Fork Tibbetts Creek will eliminate two fish passage barriers and open a combined 2,789 linear feet of newly accessible habitat to salmonids. The work done on these streams (except for the lengthening of the culvert) will be considered "self-mitigating."

To mitigate for the combined 139 linear feet of perennial stream that will be placed in a culvert as a result of the widening project, WSDOT proposes to enhance approximately 233 linear feet of Tributary B (**Figure 6**). Tributary B is a low-gradient, perennial tributary to Tibbetts Creek. Improvements will include excavating three in-stream pools in the stream channel to serve as fish refuge during high flows, installing six pieces of LWD in these areas for shade and habitat over each pool, removing invasive species from the riparian buffer, and planting a 50-foot wide stream buffer with native emergent, shrub, and tree species (see **Tributary B Conceptual Enhancement** in **Appendix D**). The three pools will be constructed within the low-flow channel with each pool having an approximate depth of 1.5 to 2-feet. The stream channel will have an average slope of 1.5% over the full length of the restored channel and the LWD will be located towards the center of the flow and sited to provide shade and promote pool formation over time. The in-stream pools were designed in coordination with WDFW to ensure outflow in spring months to allow juvenile salmonids out access of these pool areas.

The goal of this stream enhancement design is provide habitat gain for juvenile salmonids through the creation of small in-stream pools which will provide high flow fisheries refugia and cover from predation. WSDOT will also grade back the steep stream embankments that have been filled in over time from agricultural activities, to create more gradual stream banks. The stream bank slopes will be constructed at a 10:1 slope on both sides of the channel to promote additional flood storage and have been designed to avoid stranding of juvenile salmonids during low flows.

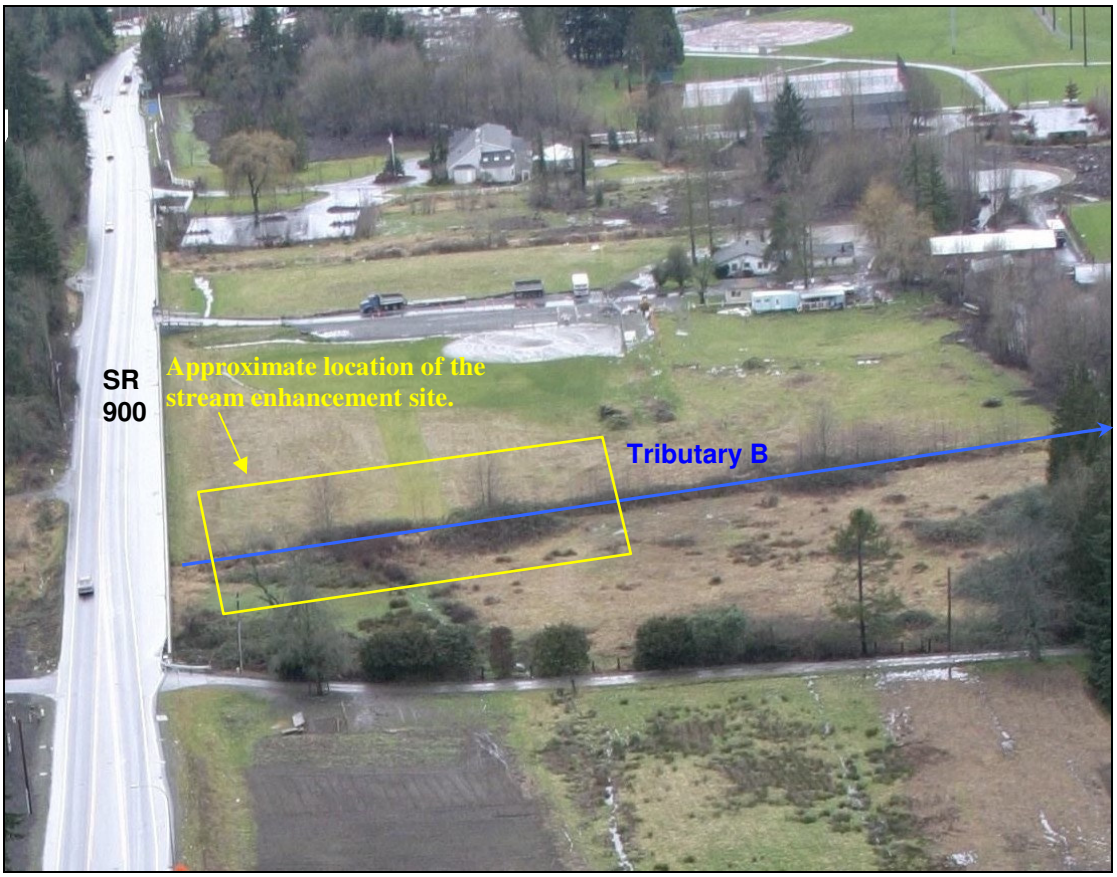

Figure 6. Tributary B riparian corridor. Photo taken facing north.

The excavated stream bank areas (stream enhancement mix) will be planted with black cottonwood, Pacific willow, red-osier dogwood, Sitka willow, sawbeak sedge, and slough sedge. The wetland areas and wet riparian buffer surrounding the stream will be planted with black cottonwood, Oregon ash, Pacific willow, western red cedar, clustered wild rose, red-osier dogwood, salmonberry, Sitka willow, and twinberry. The eastern extent of the stream in the restoration area is upland. Existing trees will be preserved, and the area will be planted with an upland mix consisting of big-leaf maple, Douglas fir, western red cedar, Indian plum, red elderberry, snowberry, thimbleberry, and vine maple.

Restoration of Temporary Impacts

WSDOT will restore areas of temporary wetland impacts by planting Oregon ash, western red cedar, clustered wild rose, red-osier dogwood, Sitka willow, and twinberry (**Appendix E**). WSDOT will restore areas of temporary wetland and stream buffer impacts by planting big leaf maple, Douglas fir, western red cedar, beaked hazelnut, Indian plum, red elderberry, snowberry, thimbleberry, and vine maple. In buffer areas that are designated clear zones, areas will be planted only with native grass seeding. In all temporary impact restoration areas, no trees will be planted within the sight distance and clear zone limits.

REGULATORY COMPLIANCE FOR THE WETLAND MITIGATION SITE

The proposed wetland mitigation site will be monitored for ten years to demonstrate the

provision of intended functions. Goals describe the overall intent of mitigation efforts and objectives describe individual components of the mitigation sites in detail. Interim performance measures and success standards describe specific on-site characteristics that indicate a function is being provided. Interim performance measures are used to guide management of the mitigation sites. Success standards are thresholds to be measured during the final year of the monitoring period that demonstrate each site has complied with regulatory requirements and is providing the intended functions. Contingency plans describe what actions can be taken to correct site deficiencies.

Goal

The goal of the proposed compensatory wetland mitigation site in LSSP is to replace acreage and functions lost due to the wetland and buffer impacts associated with the proposed widening project. The mitigation at LSSP is addressed in this section, and has separate requirements from the Tributary B stream mitigation site (see Regulatory Compliance for the Stream Mitigation Site).

Functions and Values

The site will be graded to allow flows from Tributary 0178a to enter the mitigation site. This excavation will allow flood flows to disperse across a wider area which will increase flood flow alteration and flood storage functions. The channel side slopes and wetland creation area will be planted with water-tolerant shrub vegetation. The scrub-shrub vegetation will slow channel flows and facilitate sediment, nutrient, and toxicant removal functions. Shrub vegetation will also stabilize the channel banks and provide a source of leaf litter that will contribute to the organic matter supply. The created wetland area adjacent to the stream will provide habitat for aquatic invertebrates and amphibians. The site will contain a high diversity of plant species and will provide general habitat suitability for a variety of wildlife species. Finally, interpretative signage may be installed at the perimeter of the mitigation site and along the informal pedestrian trail providing educational value (this is still being negotiated with the Park).

Objectives, Interim Performance Measures, and Success Standards

The following list describes the thresholds that will determine site success and guide management for the wetland mitigation site.

Objective 1 – Hydrology

The LSSP wetland mitigation site will possess ground and/or surface water inundation or saturation sufficient to support the wetland site.

Performance Measures

- *Years 1-9*—The soils will be saturated to the surface, or standing water will be present at 12 inches below the surface or less, for a consecutive number of days greater than or equal to 10% of the growing season in years when rainfall meets or exceeds the 30-year average.

- *Year 5*—The wetland areas will be delineated using current methods. The mitigation site will contain 1.74 acres of created wetland and 0.11 acre of enhanced wetland for a total wetland area of 1.85 acres.

Success Standards

- *Year 10*—The wetland area at LSSP will be delineated using current methods. The mitigation site will contain 1.74 acres of created wetland and 0.11 acre of enhanced wetland for a total wetland area of 1.85 acres.

Objective 2 – Wetland Vegetation

The LSSP wetland mitigation site will include a scrub-shrub wetland community.

Performance Measures

Year 1

- The vegetation will achieve 100 percent survival of planted woody species at the end of the of the first year plant establishment period within the scrub-shrub planting areas. If all dead woody plantings are replaced, the performance measure will be met.

Year 3

- The native woody species will maintain a minimum average density of four plants per 100 square feet within the scrub-shrub planting areas. Native colonizing vegetation will be included in this coverage calculation.

Year 5

- Native facultative or wetter woody species will achieve a minimum of 35 percent coverage within the scrub-shrub planting areas. Native colonizing vegetation will be included in these coverage calculations.

Year 7

- Native facultative or wetter woody species will achieve a minimum of 50 percent coverage within the scrub-shrub planting areas. Native colonizing vegetation will be included in these coverage calculations.

Years 1-9

- No more than thirty percent cover by non-native invasive species as listed in **Table 10** in the wetland areas except:
    - 15% maximum cover across the entire mitigation site for blackberry *(Rubus laciniatus* and *R. armeniacus).*
    - The presence of Japanese knotweed *(Polygonum cuspidatum* and related species) and purple loostrife *(Lythium salicaria)* will initiate eradication measures.

Success Standards

Year 10

- The mitigation site will include approximately 1.85 acres of scrub-shrub wetlands.
- Native facultative or wetter woody species will achieve a minimum of 70 percent coverage within the scrub-shrub planting areas. Native colonizing vegetation will be included in these coverage calculations.
- No more than thirty percent cover by non-native invasive species as listed in **Table 10** in the wetland areas except:
    - 15% maximum cover across the entire mitigation site for blackberry *(Rubus laciniatus* and *R. armeniacus).*
    - The presence of Japanese knotweed *(Polygonum cuspidatum* and related species) and purple loostrife *(Lythium salicaria)* will initiate eradication measures.

Objective 3 – Buffer Vegetation

The LSSP mitigation site will include approximately 1.98 acres of enhanced wetland buffer vegetation and 0.25 acre of enhanced riparian buffer vegetation, totally 2.23 acres of enhanced buffer.

Performance Measures

Year 1

- The vegetation will achieve 100 percent survival of planted woody species at the end of the of the first year plant establishment period within the wetland buffer and riparian buffer planting areas. If all dead woody plantings are replaced, the performance measure will be met.

Year 3

- The native woody species will maintain a minimum average density of four plants per 100 square feet in the wetland buffer and riparian buffer planting areas.

Year 5

- Native woody species will achieve a minimum of 30 percent coverage in the wetland buffer and riparian buffer planting areas. Native colonizing vegetation will be included in this coverage calculation.

Year 7

- Native woody species will achieve a minimum of 40 percent coverage in the wetland buffer and riparian buffer planting areas. Native colonizing vegetation

will be included in this coverage calculation.

Years 1-9

- No more than thirty percent cover by non-native invasive species as listed in **Table 10** in the buffer areas except:
    - 15% maximum cover across the entire mitigation site for blackberry *(Rubus laciniatus* and *R. armeniacus).*
    - The presence of Japanese knotweed *(Polygonum cuspidatum* and related species) and purple loostrife *(Lythium salicaria)* will initiate eradication measures.

Success Standards

Year 10

- Native woody species will achieve a minimum of 50 percent coverage in the wetland buffer and riparian buffer planting areas. Native colonizing vegetation will be included in this coverage calculation.
- No more than thirty percent cover by non-native invasive species as listed in **Table 10** in the buffer areas except:
    - 15% maximum cover across the entire mitigation site for blackberry *(Rubus laciniatus* and *R. armeniacus).*
    - The presence of Japanese knotweed *(Polygonum cuspidatus* and related species) and purple loostrife *(Lythium salicaria)* will initiate eradication measures.

Table 10. Non-native invasive species.

Scientific Name	Common Name
Buddleia alternifolia	fountain butterfly bush
Cytisus scoparius	Scot's broom
Geranium robertianum	herb Robert
Ilex aquifolium	English holly
Iris pseudacorus	yellow flag iris
Lythrum salicaria	purple loosestrife
Polygonum cuspidatum (and related species and hybrids)	Japanese knotweed
Prunus laurocerasus	English laurel
Rubus laciniatus	evergreen blackberry
Rubus armeniacus (discolor)	Himalaya or Armenian blackberry

REGULATORY COMPLIANCE FOR THE STREAM MITIGATION SITE

The proposed stream mitigation site will be monitored for five years to demonstrate the provision of intended functions.

Goal

The goal of the stream mitigation site is to enhance 233 linear feet of a fish bearing stream in order to replace functions lost due to stream impacts associated with culvert widening and replacement in the proposed widening project. The mitigation also consists of a total of 0.58 acre of riparian buffer enhancement, which will occur on each side of the stream.

Functions and Values

The mitigation at Tributary B will include excavating three areas in the stream channel to serve as fish refuge during high flows, installing six pieces of LWD in these areas, removing invasive species from the riparian buffer, and planting a 50-foot wide stream buffer with native emergent, shrub, and tree species.

The stream mitigation site will increase habitat for salmonids by providing high flow refuge. Invasive species will be removed and a greater diversity of native trees, shrubs, and emergents will be planted. As the riparian buffer matures, it will increasingly contribute screening, shading, organic debris and large woody debris recruitment to the stream. The site will provide increased wildlife habitat by improving the quality of the riparian buffer, as well as increase the area and food resources available for aquatic invertebrates and amphibians, which in turn will lead to increased food resources for salmonids.

When compared to the streams and stream buffers that were impacted by the widening project, the Tributary B mitigation site should have a net increase in stream functions. The impact areas immediately adjacent to the roadway are often composed of fewer trees and a greater number of invasive species than areas more distant to the road. Additionally, the streams themselves near road crossings are usually in a degraded condition because of the improperly sized or degrading culverts. The stream mitigation area will provide better habitat value as it is not adjacent to the roadway. The stream mitigation on Tributary B, along with the removal of the two fish passage barriers on Clay Pit Creek and West Fork Tibbetts Creek, and the stream enhancement on Tributary 0178a at the LSSP mitigation site will substantially improve the riparian areas in the SR 900 project corridor upon completion of this project.

Objective 1 – Buffer Vegetation

The stream mitigation site at Tributary B will include a total of 0.58 acre of enhanced riparian vegetation.

Performance Measures

Year 1

- The planted woody species will achieve 100 percent survival at the end of the of the first year plant establishment period in the riparian buffer planting areas. If all dead woody plantings are replaced, the performance measure will be met.

Year 3

- The native woody species will maintain a minimum average density of four plants per 100 square feet in the riparian buffer planting areas.

Years 1-4

- No more than thirty percent cover by non-native invasive species as listed in **Table 10** in the riparian buffer areas except:
    - 15% maximum cover across the entire mitigation site for blackberry *(Rubus laciniatus* and *R. armeniacus).*
    - The presence of Japanese knotweed *(Polygonum cuspidatum* and related species) and purple loostrife *(Lythium salicaria)* will initiate eradication measures.

Success Standards

Year 5

- Native woody species will achieve a minimum of 30 percent coverage in the riparian buffer planting area. Native colonizing vegetation will be included in this coverage calculation.
- No more than thirty percent cover by non-native invasive species as listed in **Table 10** in the buffer areas except:
    - 15% maximum cover across the entire mitigation site for blackberry *(Rubus laciniatus* and *R. armeniacus).*
    - The presence of Japanese knotweed *(Polygonum cuspidatus* and related species) and purple loostrife *(Lythium salicaria)* will initiate eradication measures.

MONITORING PLAN

The wetland mitigation site and buffer enhancement in the LSSP will be monitored for a ten year period to meet the performance standards. Formal monitoring procedures will be performed in years one, three, five, seven, and ten after initial acceptance of the mitigation construction. The site will be evaluated informally the summer following plant installation to evaluate survival rates and document the presence of non-native invasive species. Informal (qualitative) monitoring will occur in years two, four, six, eight, and nine. Monitoring reports will be submitted to the Corps of Engineers, Ecology, Issaquah, and other resource agencies for review and comment. Monitoring reports will be completed by April of the year following the previous monitoring activities occurring in years one, three, five, seven, and ten. Mitigation success will be measured by the attainment of performance and success standards.

Monitoring of the stream mitigation site will be conducted for five years. The stream mitigation

site will be evaluated the summer following plant installation to evaluate survival rates and document the presence of non-native invasive species. Informal monitoring for plant survival will take place every summer after planting for five years. Formal plant survival monitoring procedures will be performed in years one, three, and five.

CONTINGENCY PLAN

As necessary, contingency measures (i.e. adaptive management options) will be implemented to meet performance measures and success standards. The following describes potential situations that may occur on site and the potential contingencies that might be implemented to correct the problem. Since not all site conditions can be anticipated, the contingencies discussed below do not represent an exhaustive list of potential problems or remedies. In the event that the site is deemed unsuccessful, the resource agencies will be consulted regarding adaptive management or remediation options.

Hydrology

Hydrologic problems occurring on a wetland mitigation site are typically the result of either insufficient water or excessive water. Insufficient water can occur seasonally during drought conditions or can be a long-term problem. Long-term problems can be the result of altered surface water flows on- or off-site for surface water driven wetlands. For ground water driven mitigation sites, typical long-term hydrologic problems that result in either excessive or insufficient hydrology can occur from a design based on limited or inaccurate groundwater data, the establishment of incorrect final grade elevations, unperceived soil conditions that alter groundwater flows, development of surrounding properties, or beaver activity. Hydrologic contingency measures will be implemented based on site conditions observed or monitoring data collected during the annual monitoring site visits. If permanent standing water is present on the site of sufficient depth to alter the plant community composition of the woody vegetation, then the contingency for excessive hydrology will be initiated. Contingencies for insufficient or excessive hydrology are:

- Clearly identify the source of the problem
- Consult with the mitigation design team, including members of Biology, Landscape Architecture, and Hydrology, as well as the resource agencies to determine an appropriate course of action.
- Adjust site elevations though grading to achieve appropriate hydrologic conditions, or adjust plant community composition, or take other appropriate actions agreed upon by all concerned parties.

Vegetation

Problems related to vegetation include plant mortality, lack of vigor and vitality, and poor growth resulting in low plant cover. These problems can be the result of insufficient maintenance, particularly watering in the first few growing seasons, animal browse, competition from invasive species, incorrect plant selection, altered site conditions, and vandalism. Contingencies for plant mortality and poor plant cover include:

- Plant replacement – Additional planting may be required to meet plant survival and plant cover requirements. Plant species will be evaluated in relation to site conditions to determine if plant substitutions will be required.

- Weed control – Control of non-native invasive species may be required to meet survival and plant cover requirements. Weed control methods could include mechanical or hand control, mulching, or herbicide application.

- Herbivore control – If plant survival or vegetation cover standards are not met because of animal browse, the wildlife responsible will be identified and the appropriate control measure will be employed. This could include plant protection, fence installation, or the use of repellents.

- Vandalism – To prevent vegetation disturbance from vandalism, fence installation and sensitive area signage may be installed.

MAINTENANCE

The goal of the proposed mitigation is to create a functional, self-sustaining system that requires little or no maintenance. The LSSP mitigation site will be maintained for 10 years by WSDOT; at that time, responsibility of the site will be returned to the state park. WSDOT will retain ownership of the stream mitigation site in perpetuity. Maintenance will be conducted on an as-needed basis and can include plant replacement, weeding, mulching, fertilizing, watering, and trash collection.

Reed canarygrass (*Phalaris arundinacea*) is present in this watershed, providing continual sources of propagules to the mitigation site. Reed canarygrass will be controlled to ensure native vegetation becomes well established. Management activities to control reed canarygrass will be restricted to the area landward of the ordinary high water mark of all waterbodies as established by GPS to avoid adverse impacts to fisheries resources from herbicide application.

Soil moisture retention to promote plant survival will be accomplished through the following methods:

- Disturbed soils will be amended with organics if necessary to enhance moisture retention.
- In areas not prone to flooding, mulch en masse will be placed on the ground around plant stems.
- Moisture levels of soil in planting areas will be maintained by natural rainfall and, as needed, by supplemental watering. It is anticipated that supplemental watering will occur during the dry periods of the active growing season (June 15 through October 15). Supplemental watering will extend through the second growing season when plants are expected to be adapted to the site. Rainfall and available soil moisture will dictate the frequency of supplemental watering. When watering is needed, it is expected that water will be applied at a rate of approximately two gallons per plant or 1-inch over the entire planting area per application.

REFERENCES

Brinson, M. M. 1993. A hydrogeomorphic classification for wetlands. Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

City of Issaquah. 2003. Stream inventory and habitat evaluation report. March 2003.

City of Issaquah. 2006. City of Issaquah critical area regulation amendments, wetlands and streams definitions, rating systems, buffer widths and buffer averaging. Adopted May 15, 2006. Effective date August 21, 2006. Available online at: http://www.ci.issaquah.wa.us/Page.asp?NavID=1225. Accessed June 26, 2006.

Claywell, L. 2006. Personal communication with Terry Sullivan.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. Government Printing Office, Washington, D.C.

Ecology et al. 1994. Guidelines for Developing Freshwater Wetlands Mitigation Plans and Proposals. Publication #94-29. Washington Department of Ecology, Washington Department of Fisheries, Washington Department of Wildlife, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, and U.S. Fish and Wildlife Service.

Ecology. 1997. Washington state wetland identification and delineation manual. Publication #96-94. Washington Department of Ecology, Olympia, WA.

Ecology. 2004. Washington state wetlands rating system for Western Washington. Publication #04-06-025. Washington Department of Ecology, Olympia, WA.

Entranco. 1999. East Village final environmental impact statement. Prepared for the City of Issaquah and Intracorp.

Environmental Laboratory. 1987. Corps of Engineers wetland delineation manual. Technical Report Y-87-1, Environmental Laboratory, Department of the Army, Waterways Experiment Station, Vicksburg, MI.

Franklin, J.F. and C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR.

Fraser, Jim. Washington Department of Fish and Wildlife. Multi-Agency Permitting Team Area Habitat Biologist. Personal written communication with Dan Hagglund. June 24, 2004

Kerwin, J. 2001. Salmon and steelhead habitat limiting factors report for the Cedar – Sammamish Basin (Water Resource Inventory Area 8). Washington Conservation Commission. Olympia, WA.

King County. 2001. Known Freshwater Distribution of Coho Salmon. Water Resource Inventory Area (WRIA) 8. Lake Washington/Cedar/Sammamish Watershed. Revised May 2001. Available online at: http://dnr.metrokc.gov/Wrias/8/fish-maps/coho/index.htm. Accessed August 17, 2005.

Montgomery Water Group. 2001. Montgomery Water Group, Inc. Cougar Mountain East Village master drainage plan for modified preferred development alternative, Final. January 2001.

USDA, NRCS. 2005. Hydric soils of the United States. U.S. Department of Agriculture, Natural Resource Conservation Service in cooperation with the National Technical Committee for Hydric Soils. Available online at: http://soils.usda.gov/use/hydric/. Last updated August 2005. Accessed June 9, 2006.

USDA, SCS. 1973. United States Department of Agriculture, Soil Conservation Service, Soil Conservation Service in cooperation with the Washington Agricultural Experiment Station. Soil survey, King County area, Washington. Government Printing Office, Washington, D.C. Available online at: http://www.or.nrcs.usda.gov /pnw_soil/ wa_reports.html. Accessed May 24, 2006.

WDFW. 2004. Washington State Department of Fish and Wildlife. Technical Applications Division, Fish Passage Barrier Removal Program. Progress performance report for WSDOT fish passage inventory. May 2004. Available online at: http://www.wsdot.wa.gov/ environment/ fishpass/state_ highways .htm. Accessed August 17, 2005.

WDFW. 2003. Design of Culverts for Road Passage. Washington Department of Fish and Wildlife, Olympia, WA. Available online at: http://wdfw.wa.gov/hab/engineer/cm/.

WDFW, WSDOT. 2002. Washington Department of Fish and Wildlife, Washington State Department of Transportation. Memorandum of agreement between Washington State Department of Fish and Wildlife and Washington State Department of Transportation concerning construction of projects in state waters (Chapter RCW 77.55. RCW and Chapter 220-110 WAC). June 2002. Available online at: http://www.wsdot.wa.gov/ environment/Programmatics/docs/MOA_Final.pdf. Accessed August 18, 2005.

WSDOT. 2006. Wetland Biology Report, SR 900: 78th Vicinity to Newport Way Widening. WIN #A90098V. Washington State Department of Transportation, Environmental Affairs Office, Shoreline, WA. July 2006.

WSDOT. 2005a. WSDOT Environmental Procedures Manual. Washington State Department of Transportation, Environmental Affairs Office, Olympia, WA.

WSDOT. 2005b. Fisheries and Stream Survey Report, SR 900: 78th Vicinity to Newport Way Widening. WIN #A90098V. Washington State Department of Transportation, Environmental Affairs Office, Shoreline, WA. August 2005.

WSDOT. 2004. State Highway Log. Washington State Department of Transportation, Planning and Programming Service Center: State Highway Log Planning Report. SR 2 to SR 971. 1657 pp. 2004. Available online at: http://www.wsdot.wa.gov/mapsdata/tdo/PDF_and_ZIP_Files/HwyLog2004.pdf.

WSDOT. 2000. Wetland functions characterization tool for linear projects. Washington State Department of Transportation, Environmental Affairs Office, Olympia, WA.

Washington State Parks. 2006. Lake Sammamish State Park. Park information available online at: http://www.parks.wa.gov/parkpage.asp?selectedpark=Lake+Sammamish&pageno=1. Accessed September 18, 2006.

APPENDIX A: SENSITIVE AREA IMPACT PLAN SHEETS

APPENDIX B: MITIGATION SITE WETLAND MEMO

APPENDIX C: WETLAND MITIGATION SITE DESIGN PLAN SHEETS

APPENDIX D: STREAM MITIGATION SITE DESIGN PLAN SHEETS

APPENDIX E: TEMPORARY IMPACT RESTORATION PLAN SHEETS

APPENDIX F: BORING LOGS